

DRUGS AND THE DRUG HABIT

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DRUGS AND THE DRUG HABIT

BY THE SAME AUTHOR
PRINCIPIA THERAPEUTICA

First Published in 1909

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INTRODUCTORY

JEAN PAUL has told us that he was acquainted with no pleasure sweeter than that of writing a book except it were to project one ; alas, we cannot all rise to the heights of a Quintus Fixlein, and our pleasure, therefore, if still we write, must needs lie upon a lowlier plane. Somewhat of our enjoyment will doubtless depend upon the theme selected and the height to which it rises above the level of the commonplace ; but “ Drugs and Drug Habits ! ”—the altitude is scarcely Alpine, and the casual glance will be likely to pass by and over this promise of a dreariness in D flat, in search of something more alluring. The facts, however, are not so dull as the title seems to proclaim, for, indeed, drugs have an attraction all their own, and a fascination at times even fatal—witness the Drug Habit. It is true the contents of the apothecary’s shop, despite the display of some marvels in colour and crystalline form, do not appeal to the passer-

by, the Peter Bell of the pavement ; but for him who knows of the potencies that lie hid in the piece of bark, the capsule, the leaf, which are there exposed to view, for him it is otherwise, and he will feel that the poet is nearer the truth who sees in these desiccations a "wild crowd of invisible pleasures."¹ Moreover, the apothecary's shop should appeal to us on other grounds, seeing that it is not of yesterday, but comes from a far past, and, in the strange characters still to be found on jar and bottle, speaks to us an ancient language. Its true lineal descendant of to-day is the scientific pharmacy, not the drug store, which is fast losing the dignity of the workshop and is in rapid process of becoming the mere vendor's booth or huckster's stall.

To understand drugs, to see them in their true light, we must know something of their story, which story is an essential part of the chronicles of Medicine ; but to follow this is to touch mankind very nearly, and to discover that the desiccation, the drug, is vital with human interests—"Nothing so human can be alien to us who are men." For this reason a brief sketch of the origin and progress of the healing art has been ventured in the pages which follow : its justification will not be wanting if the good intention be allowed.

This treatise does not aim at being a text-book ; its purpose rather is to look at the essentials of the

¹ Robert Browning, "The Laboratory."

task which disease sets and drugs undertake, and to discuss with what show of reasonableness the medicaments can claim to be equal to their task; to make clear that the practice of medicine is not at random—is not, to borrow a metaphor of Charles Reade, “a firing with bullets at snipes in a wind”—but is a pursuit with an aim, which, for the serious-minded, has never wavered in its *intention*; and so to give some assurance to the patient public for its deglutitional act of faith as it swallows the bitter pill. This its purpose; and to this end it has been thought advisable to give chief attention to those drugs which may be styled of the first magnitude, or, as Pouchet has called them, “les grands médicaments,”¹ such, for example, as opium, bark, nux vomica, digitalis, mercury, iron, arsenic; seeing that, if these can make good their title to serve, the lesser lights of the Pharmacopœia will be allowed to burn, each according to its candle-power; whereas, if they should fail, who will regard the significance of the relatively insignificant?

The teaching of biology by means of illustrative types has been strongly advocated by Professor Huxley, amongst others, and from the philosophical point of view, whence alone a real insight can be obtained, there is little doubt of its wisdom. The like holds with equal force for the study of the *Materia Medica*, if the purpose be to gain a real mastery

¹ See preface to his “*Précis de Pharmacologie et de Matière Médicale*,” 1907.

of the subject, to look right into the problems of remedial treatment; for who should stay to inquire into the action of squill as a cardiac tonic when the action of digitalis could be had in illustration, or who delay over the sedative action of codeia whilst the anodyne morphia awaited consideration? Accordingly it is representative drugs alone which will figure in the arguments of the chapters to follow; upon the representative drug as a type will rest the burden of presenting an *apologia pro usu suo* which shall bring conviction.

It is otherwise with the text-book of pharmacology; this may not overlook the lesser lights among drugs, for these will have their opportunity in time and place, and, moreover, will be called upon to meet the demands of idiosyncrasy. The text-book, indeed, must be the dictionary, the work of reference, the value of which will be in proportion to the completeness and orderliness of its contents: to this we shall have recourse each time we have to meet the detail in disease by the detail in practice.

Each drug is made up of particles, each particle carries its own remedial momentum, and according to the magnitude of the dose, *i.e.*, according to the number of particles administered, so will be the magnitude of the momentum conveyed. This momentum—physical, chemical, and physico-chemical—is remedial to the exact extent to which it is adapted to overcome the morbid momentum which

the body cells have acquired; potential up to the moment of administration, the energy contained in the dose now becomes dynamic and effective. The mathematicians, P. G. Tait and W. J. Steele, were authors of a well-known work entitled "The Dynamics of a Particle"; would that I might have ventured to borrow this inscription and have incorporated it on the title-page, with the qualification *remedial*—would that I could have borrowed more from the same source: the mathematics of disease should be of surpassing interest, but they will be very high and must belong to Posterity.

Along with the rapid advances in physiology and pathology, along with the developments of technique, pharmacology has progressed, if not *pari passu*, yet at a greatly accelerated pace, and the text-book, instead of enduring for centuries like the treatise of Pedanius Dioscorides on *Materia Medica*, now lasts less than a decade. In attendance upon this rapid movement a very complex and changing terminology has arisen: witness the language which sets forth the current views on infection and immunity; witness the recommendations of present-day physiologists on protein nomenclature.¹ We may take it that this complexity is not an abiding presence amongst

¹ See *Journal of Physiology*, January 27, 1907; also the report of the Committee of the American Physiological Society, *Journal of Physiology*, January, 1906.

us, and that the last words to be spoken will be less elaborate. The endeavour throughout these pages has been persistently in this sense, viz., to seek beneath the multiplicity of surface detail for that underlying Simplicity which we know is there—that Sancta Simplicitas which John Huss canonised at the stake.

Je ne sais pas, en effet, d'abaissement plus grand et de souffrance plus pénible que de faire de la médecine sans y croire, et de se traîner sans conviction dans des formules qui ne disent rien à l'esprit, et dans une routine qui le déshonore et l'énerve. . . .

J.-B. FONSSAGRIVES
"Traité de Thérapeutique Appliquée,"
Introduction



DRUGS AND THE DRUG HABIT

HISTORICAL

τὸ φάρμακον

THE beginnings of Medicine reach far back into Time, and it is in myth and fable that she first takes shape. Dim is the vision of those early days when Jove hurled his thunderbolts and Apollo, the Sun God, drew his bow; but the need of the healing art was felt even then, for violence and disease and stealth of days were already in possession, consuming man's substance and leading him an unwilling victim to the shores of the Dark Stream. In those days the gods, though immortal, disdained not to avail themselves of the treasures which the earth presented for use, and Pæon it was, skilled in medicine, who, practising on Mount Olympus, knew how to prepare the dressing which should still the pain and staunch the bleeding of wounds which could grieve if they could not kill. How much more did not the earth-born stand in need of these treasures, and what benefaction might exceed that

which he bestowed who could stay the reluctant steps of the wayfarer to Hades? The gods have ever stood as patrons towards mankind, privileged lords dispensing the upper, middle, and lower justice as it pleased them, and it was not likely that they would stand aside and allow the healing art to work benefactions in which they played no part; from the first, therefore, they appear as Patron Divinities of the Art, and thus we learn from the poets how Orestes makes his appeal to Apollo as tutelary God of Medicine, and how the wounded Æneas, the arts of Iapis failing, is healed by the infusion which Venus herself prepares from that Dittany, hairy-leaved and purple-flowered, which she gathers on Cretan Ida—"non hæc humanis opibus, non arte magistrâ proveniunt." About this time Chiron, the beneficent Centaur, imparts his knowledge of medicine and of surgery to the heroes of Homeric fame—Æsculapius, Nestor, Achilles, Ulysses, Machaon, Podalirius, and others. Subject to mortality, Chiron himself dies of a malignant ulcer caused by the arrow of Hercules, whence we are told that similar ulcers against which remedies proved fruitless were called Chironic.¹ Æsculapius becomes so skilled in healing that he even raises from the dead—respite only—but to avenge this encroachment upon his domain Pluto appeals to Jove, and Æsculapius himself forfeits life. Succeeding generations keep green the memory of Æsculapius and pay him divine honours, and

¹ For this and much else see Kurt Sprengel's "Geschichte der Arzneykunde." Should our inveterate ulcer, chronic so called, be really Chironic?

his successors become established, in the island of Cos particularly, as a special caste or order, holding and passing on, under an oath of secrecy, the knowledge which they had received of disease and its treatment—these are the Asclepiads.

And so the gods and demigods and heroes pass before us in procession, each pointing the finger at disease and holding up to view τὸ φάρμακον, the remedy, bidding us acquaint ourselves with its virtues, and hinting, if not promising, the realisation some day of a *panacea*.

Mankind sits down to learn, and on the island of Cos and upon the promontory of Cnidus, to the accompaniment of the waves of the Ægean Sea, the Asclepiads observe and ponder many things—thus these two celebrated schools of medicine arise.

Hippocrates II, the Great, now makes his appearance, and forthwith Medicine puts off the wrappings which obscured, and reveals a goddess worthy our devotion, and claiming man's highest endeavours. Can anything add to the dignity of the appeal which the opening lines of the first aphorism make: "Life is short; Art is long: the Moment urgent, yet Experiment hazardous, yea, and Judgment difficult"? It is all there: the brief span of life, the endless stretch of Art; the urgency of the moment which passes, and which in passing says now, now, now! withal the peril which attends upon experiment and the fallibility of judgment. Alternately we are impelled to action, and withheld; but inaction is furthest from the purpose of Hippo-

crates; his one anxiety is that the combatant, before stepping into the arena, shall count the cost and prepare the mind—then shall he face the odds: to this end the precepts follow.

Hippocrates recognises law: in the course of disease nothing runs at haphazard; and though styled disorder this is in the sense only of another kind of order, for there is nothing disorderly in the movement of disease: in this orderly movement the remedy has its opportunities, its times of fittest administration—Hippocrates recognises a *vis medicatrix naturæ* which the physican must not hinder, but where possible actively assist: upon this point, however, it is essential that we should be quite clear, viz., that Hippocrates, whilst acknowledging this natural movement or trend, was fully aware of the oft-repeated insufficiency of the *vis medicatrix*, and that he saw here precisely the physician's opportunity.

Hippocrates passes, Aristotle appears, and though his teachings tell less directly upon medicine, indirectly they bear fruit in the schools which now arise at Alexandria, and which embody, so far as medicine is concerned, the rival teachings of Herophilus and Erasistratus. The former seems to possess more of the contemplative nature; he is the scientific physician to whom etiology and theory appeal most, whilst Erasistratus is before all things the practical man who is content rather to observe and record the surface-play of things, and directly deal with these without pausing to probe more deeply—he is the Empiric, and his school outlives

by a century the more academic and anatomical school of the Herophilists.

The scene shifts from Alexandria to Rome—Greek thought puts on the toga, but remains Greek thought though styled Roman. We are still before the birth of Christ, somewhere about the year 200, when the Greek physician Archagathus, name of good augury, is mentioned as practising in Rome. Then follows Asclepiades, the friend of Cicero, born B.C. 124; Themison follows him. Themison systematises the teachings of Asclepiades, and the Methodic School takes origin. This school is characterised by its recognition of certain general states of the body, as of *constriction* and *relaxation*, also of a middle state between constriction and relaxation. These states are with us still, under these same names or their equivalents, such as sthenic and asthenic, tonic and atonic, or under terms qualified with the prefixes hyper- and hypo-. The Methodic School is simple in its treatment. What is constricted must be relaxed, what is relaxed must be constricted, whilst the intervening middle state, which one would think might very well have been left alone, has to be judiciously relaxed and constricted: such is *the Method*. This school pays but little attention to the causation of disease and to the part played by the organs of the body severally: it discards the Hippocratic doctrine of the *Humours* and replaces it by a doctrine of the *Solids*, and because it sees that Nature when left to herself does not always work in the direction of health, therefore it sets

aside the doctrine of the *vis medicatrix* altogether. And now there come the Pneumatics with their protest against the materialism of Humoralists and Solidists alike—they claim the existence of a universal soul, the Pneuma, and that disease results from the operation of this upon the body. Medicine is thus fairly launched, well furnished with schools of thought, but even then, though it was some sixteen hundred years before Raleigh was to send his soul upon “a thankless arrant,” to “tell schools they want profoundness, and stand too much on seeming,” even in that far day there were not wanting men to whom the conflicts and contradictions of the schools, and their insufficiencies, when taken separately, were only too apparent. These men refused to be trammelled by the limitation of any one school, and under the name of Eclectics, asserted their right to select from each and all that which they might think good and useful.

About this time, *i.e.*, the end of the last century before Christ and the beginning of the first century A.D., the great names of Celsus, of Pliny the Naturalist, and of Dioscorides of Anazarba occur. The date of the last named would seem to be difficult of determination, but it is thought that he preceded Pliny. Dioscorides writes a book on the *Materia Medica*, which during sixteen to seventeen hundred years serves as the world's text-book—science was not so exacting then as now. A greater personality approaches—Claudius Galenus of Pergamus; born A.D. 131, he lives to the age of about seventy, and succeeds within the working years of this life in

constructing out of the materials of the older conflicting systems of medicine a new system of such remarkable completeness, so satisfying to the human mind, always eager for dogmatic teaching, that it grows in authority right up to the decline of Roman civilisation, then permeates Arabian teaching, and finally reaches Western Europe, where it flourishes unrivalled, if not unchallenged, until the advent of modern science in the seventeenth and eighteenth centuries.

Galen attacks the materialism of his day and grafts the Pneuma, or spirit, upon the Humoral doctrine of Hippocrates. He inculcates the *temperaments*, discusses the causes of disease as near and remote, also as existing without the body and within its substance, and he raises the question of predisposition into deserved prominence. The four elementary qualities—heat, cold, moisture, dryness, which in varying admixture are found in the body—these qualities he recognises in the medicaments, which in their action accordingly are hot or cold, moist or dry: the principle of cure is by opposition, *i.e.*, by contraries. Galen lays stress on the search for indications and contra-indications in the use of drugs, and he does not overlook the selective affinities of the remedy.

“Hippocrates first broke ground, but he (Galen) made the ways smooth and practicable,” so says he of himself—too smooth, others will say of him. This is the personality which dominated the medical world right through the Middle Ages; his the *ipse*

dixit which barred the way to the would-be investigator of nature. We may consider that by now Authority has established itself with sounding names—Hippocrates, Galen, Celsus, Dioscorides, Aretæus : the time of the last named seems to be very uncertain, being placed variously between the latter half of the first and the beginning of the third century.

With the selection of Byzantium as the capital of his empire in 330 A.D., Constantine had definitely shifted the weight of supremacy eastwards, and a Byzantine School of Medicine now becomes prominent. It makes, however, no advance of real importance, but proceeds through many centuries upon the lines of Galen. The most important name in this school is that of Paulus Ægineta (Paul of Ægina) ; it occurs in the early part of the seventh century, and its fame lasts through the Middle Ages, and is in high esteem among the Arabians.

Meanwhile Rome and Italy had been subject to the migration of the Northern peoples, and thence on, Roman medicine declines more and more, flowing on only as an obscure stream of tradition, as Dr. Payne expresses it, until the discovery of printing and the Revival of Learning.

And the Far East, whence the Wise Men had come, what had it been doing all this while? Contemplating the stars and seeing mysterious affinities and sympathies between their effulgence and the dark places of the earth and the things hidden in its recesses. The beginnings of superstition lie here

but a superstition which gathers sun, moon, and stars into one fold with the earth, this is worth having, though at a heavy price. That price was to be paid; the long years of the Dark Ages were now to supervene in which a *mateotechny*, an art of vain things, was to engross the mind of man. This was to find its expression in an astrology which saw each of the Signs of the Zodiac in sympathetic association with the parts of the body severally—head, neck, shoulders, hips, loins, and so forth: truly a *ζώδιον συμπαθές*—and health, temperament, character, and even the fortunes of man, dependent upon constellations and dominant stars; in an alchemy which in its quest after gold sought the philosopher's stone and found—but this was to be after many years—chemistry; in a magic of higher and lower grade, and further subdivisions, allied to which was a complex *dæmonocracy*, against the evil powers of which the exorcism, the amulet, and talisman were marshalled, whilst by various arts the beneficent powers of the *dæmons* were invoked. It was then that prevailed the doctrine of the *æons*, or emanations of the divinity, 365 in number, and then it was that such words as *Jaldabaoth* and *Abraxas* (whence *Abracadabra*) had power. By no possibility could medicine escape the infection of the times, and magic became definitely associated with the art of healing, and the *dæmons*, which were both the occasion of disease and the source whence plants and minerals obtained their healing powers, were kept busy. They it was who conferred also on certain formulas and figures and

words, in particular on certain names from the Chaldean, Persian, Phœnician, and Hebrew languages, their remedial potencies. It is of much interest at this time, to see Pharmacy figuring actually in the system of Damascius as a form of magic.

It was at the time of the conquests of Rome in the Orient that these Eastern influences gained chief admittance, and then it was that in the streets of The City Visionaries, Transcendentalists, Gnostics, Neoplatonists, Essenes jostled each other, and in turn were jostled by fortune-tellers, exorcists, necromancers, and charlatanry in every variety; in those days, however, between the man of science and the mummer *il y avait si peu de chose*. Dark, of a truth, were those Ages, but they hid jewels of great price, and these were a belief in the unity of the universe, and, therefore, in the affinities of all its parts; also a belief in the power of the spirit over matter, for with this was proclaimed, was insisted, the dominance of the imponderables.

The day was to come when the Stellar Spectrum was to demonstrate the material kinship of the earth and stars, in confirmation of an affinity which the ancients had declared; this important step, notwithstanding the full value of the star, is yet where Shakespeare left it:—

“Whose worth’s unknown although his height be taken.”¹

Again an enlightened present-day psychology

¹ Sonnets, No. cxvi.

accepts the influence of the Psyche over the material, and seeks to discover the laws governing this influence and to develop its utility; this, though still but on the threshold of things psychical, is an immense intellectual advance upon the attitude of mind which prevailed in the remote days of which we have been speaking, but, now, before its advent, the Sons of the Desert are upon us.

With the rise of the Mohammedan Empire in the seventh century Arab influence began to make itself felt. At Damascus and at Baghdad great centres of learning arose, the latter city showing a very flourishing school in the ninth and tenth centuries, in particular under the rule of the famous Haroun Al Raschid: here at Baghdad Indian medicine found an open door. At Rome, we have seen, Greek thought put on the toga, now it wraps itself in an Arab mantle; unquenchable, a veritable Greek fire, it kindles, it illumines this fierce race. The classical period of Arab medicine begins in the middle of the tenth century with Rhazes, a Persian by birth; him follows Mesua the Younger, of whose personality so little is known that the name is thought by some to be the pseudonym of some unknown physician of the eleventh or twelfth century; his "Antidotarium" persisted through the whole of the Middle Ages as the apothecaries' working text-book. Avicenna, also a Persian, comes now (A.D. 980-1037); his celebrated work is entitled "Canon Medicinæ"; it is a complete treatise on medicine. The later alchemists have claimed Avicenna as one

of themselves; this is doubtful;¹ but alchemy, the transmutation of the metals into gold, and to this end the search for the philosopher's stone, was certainly practised by an earlier Mohammedan, known best under the name of Geber (A.D. 699–765); he is the father of practical chemistry. Arab medicine also flourished as a Hispano-Moorish School in Spain, in which country the Moors had established themselves; Abulcasis is one of the most celebrated names of this school—Avenzoar and Averroes, the latter more celebrated as a philosopher, also belong here.

Authority has thus added to her list other imposing names, but those who have looked into the matter, and can speak with authority, are satisfied that Arab medicine originated little, and was in the main Greek medicine; the great merit, however, of the Moors lay precisely there, that they received, held, and passed on this treasure. Through the medium of the Moors the East was brought more into contact with the West, and new remedies, in particular Indian and Persian medicines, thus gained admission into the practice of the physician. A further great merit which the Arabs may claim is to be found in the impulse which pharmacy received at their hands—the apothecary now comes into prominent existence.

A few words more concerning the mysterious East before passing on to the Middle Ages in the

¹ "Das Apothekenwesen," Dr. J. Berendes, 1907, p. 67.

West : of Far Cathay very little is known ; it is said that in China medicine began its literature three thousand years before Christ, and that it has scarcely changed in character since.¹ Of a supposed high grade of culture and of scientific knowledge once extant there is very little trustworthy evidence, and we may speculate at desire as to how much of knowledge or of ignorance lies behind the secret smile on the face of this ancient dweller.

Of Indian medicine the great antiquity is probable ; in this the Brahmin played a chief part, being both philosopher and physician : according to Strabo he led a life of the severest discipline and abstinence, "and in solitude brooded over the beginnings of all things."² Worthy of preservation because of its spirit is a traditional law that any one discovering a poison should not make it known under pain of death unless he had discovered the antidote, but that having done so he was free to publish abroad his discovery, and then was worthy of great reward.³ Superstition had a powerful hold upon the Indian, and he prognosticated from the stars, the flight of birds, and other circumstances. The Vedas are the oldest sources of information concerning the art of healing, but unfortunately there is great discrepancy as to the dating of one of the Vedas, viz., the Ayur-Veda of Susruta, the

¹ Berendes, *op. cit.*, p. 16.

² Sprengel, *op. cit.*, vol. i, p. 102—"und grübelte in der Einsamkeit den Ursachen aller Dinge nach."

³ *Ibid.*, vol. i, p. 103.

limits of reference lying between 1000 B.C., and the twelfth and thirteenth centuries A.D. Indian medicine utilises all three kingdoms of nature : the animal kingdom furnishes musk, the bezoar, and the leech amongst many other remedies ; the plant world is richly represented in their *Materia Medica* ; whilst the mineral kingdom also supplies numerous medicaments, among these the metals gold, silver, copper, iron, lead, antimony, tin, and arsenic, and in particular mercury, both combined and uncombined.¹ The *Currus Triumphalis Antimonii* is thus anticipated.

We come to Persia. This country possessed a healing art which was in close association with the theology of Zoroaster, and the physician belonged to the order of the priests. After the death of Alexander the Great (B.C. 320) Hellenic influence prevailed in Persia, whilst subsequently Christianity became a controlling power and Nestorian schools were founded : in the end these schools passed into Arab hands, the Arabs, however, themselves accepting the Persians as their instructors in the Sciences.

Among other things, medicine is indebted to the Persians for certain gum-resins held formerly in great esteem, and even now in frequent employ ; these are Ammoniacum, Galbanum, and a gum-resin known as Silphium, also as Laser Cyrenaicum, and sometimes styled Asa-dulcis, to distinguish it from a fœtid variety of Silphium, viz., Asa-fœtida.

The homeward journey to the West now leads us

¹ Berendes, *op. cit.*, p. 14.

past and through Assyria, Babylonia, and the country proper of the star-gazing Chaldeans until we reach the strip of land bordering upon the Mediterranean which held the Phœnicians, or such of their number as were not upon the high seas, intent on traffic or on colonisation. Of these ancient peoples we know that they practised a healing art, and that, in addition to the exorcism, this art included the use of drugs; we know also that a chirurgery was in use among the Babylonians, for one of the titles of the healer was "Lord of the Knife." Apart from this our knowledge is very scanty and fragmentary (the inscribed tiles are in large part broken), though we can hardly believe that the Art can have reached a high degree of perfection if the tradition be true which tells that the Babylonians would place their sick by the wayside and in the market-place, in order that the passer-by, who perchance might have been similarly afflicted, should impart advice.¹

We are now in geographical touch with the Jews, a people which, during its long sojourn in Egypt, could not fail to have been influenced by, and must have assimilated in part, the wisdom of the Egyptians. Still it would seem that their knowledge of disease and its treatment was to a great extent their own; this is inferred from their theory and treatment of infection, in particular their recognition of the part played by contact in the dissemination of disease, and the control of its spread by isolation

¹ Berendes, *op. cit.*, pp. 6 and 7, 8.

and cleanliness.¹ The Levites, not the priests, were the practitioners, but the priest's official sanction was necessary before the cleansed leper could enter the Temple, and behind and through every act of healing worked the might of Jehovah the all-seeing, the all-powerful, "For I am the Lord that healeth thee" (Exod. xv, 26).

Tradition assigns to Solomon the authorship of a treatise on medicine, in which disease is cured by natural means, and it tells of the destruction of the same book because the practice of the Levites by expiatory offerings suffered thereby.²

Though relying extensively on dietetic and hygienic measures to meet and to prevent disease, the Israelites did not despise drugs; thus in common use were Ginger, Cinnamon, Saffron, and Silphium, also, it is thought, Ergot of rye and Mandragora, whilst in the treatment of wounds the balsam of Amyris Gilead, also oil and wine in mixture, were much employed. A pharmaceutical technique of some complexity seems to have been developed by them.³

The last of the Old-World civilisations to be considered is the Egyptian. The priest is the physician here and the healing art is part of the divine office; this art is secret and is imparted to the initiated alone; it is hereditary. A fetich worship prevails, and exorcism and the incantation play an important part in the treatment of disease. In

¹ Berendes, *op. cit.*, pp. 9, 10 ² Sprengel, vol. i, p. 96.

³ Berendes, *op. cit.*, p. 10.

spite of an extraordinary development of pharmacy, and of drug treatment in general, the practice of medicine does not tend to progress, and for two reasons: (1) because of its restriction to an order or caste, and (2) because of the secrecy which surrounds it; it is an art set apart, enclosed within high walls. Under these circumstances the wonder is that it attained to the level which it appears to have reached. The numerous pharmaceutical processes which the papyri indicate, and the large number of medicinal preparations in use, such as draughts, electuaries, pills, inhalations, vapours, gargles, injections, salves, plasters, poultices,¹ point to a considerable armamentarium, which, moreover, was regulated by a *Codex medicamentarius*. Opinions differ as to the amount of chemical knowledge possessed by the Egyptians, some authorities crediting them with a large store. It has been argued that the practice of embalming must necessarily have led to a knowledge of anatomy, but the recorded mode of performance makes this very doubtful.² The clear skies of Egypt favoured a busy commerce with the stars, and astrology developed early in the history of the inhabitants of the Nile valley.

It is related by Herodotus that specialism prevailed in Egypt, each distinctive form of disease appropriating its own particular physician: if this be true the general physician may take heart, for the specialist, having proved a bird of passage in the past, may again take wing.

¹ Berendes, *op. cit.*, p. 2.

² Sprengel, vol. i, pp. 81, 82 *et seq.*

From the time of Alexander the Great and the Ptolemies who followed him the influence of Greek thought becomes paramount in Egypt. The School at Alexandria now takes origin and flourishes.

We must return to the West, where, as we have seen, Roman medicine had declined and had dwindled into "an obscure stream of tradition." The conquests of the Moors have taken place, and these have established Arabian supremacy in the Spanish peninsula, where under the Caliphate of Cordova its most brilliant period is set in the ninth and tenth centuries. From the middle of the eleventh century the Hispano-Moorish power declines and the Moors are confined within the limits of the kingdom of Granada: finally this kingdom is destroyed in 1492. These events bring us right through the Middle Ages, including the epoch of the Crusades, up to the discovery of America and the beginnings of modern history.

Though the dominion of the Moors had reached the farthest West in the land of Spain, yet it lay quite outside the life of the West as we are to understand that geographical term; for meanwhile Christianity had claimed the Occident for its own, and between its rule and the rule of the Moors the sword's point was the only point of contact. The spread of Christianity was the main fact of the early Middle Ages, and a chief feature in this spread was the rise and growth of the Religious Orders. Most notable amongst these was the establishment of the

Benedictine Rule, which began with the foundation of the monastery at Monte Cassino by St. Benedict in the early half of the sixth century. In spite of many hard things which Sprengel has to say about monastic learning, especially in relation to medicine, there can be no doubt that the great religious foundations, the Benedictine in particular, did cherish learning, besides being centres of missionary, civilising, and educational effort.¹ They taught the dignity of labour, and in the busy hive of the monastery, multifarious as were its activities, no labour outshines that which the scholar monk performs as he bends over his vellum and inscribes. Through the quiet Scriptoria of the abbeys and priories the "obscure stream of tradition" is flowing with a movement of steady persistence, though still darkly. Here is Art, plain to see; but here also is Science, though the copying hand, enamoured of its lettering, is perhaps all unconscious of the weight of the *litera scripta*; for here is Dioscorides, here Galen, and here Hippocrates, in Latin dress it may be, but here they are, the Immortals, and they guide the patient fingers and live again in fair copy. The wise words of advice of the Benedictine Cassiodorus, aforetime Chancellor to Theodoric, King of the Goths, were to bear fruit—the monks copied and conserved, however limited the extent to which they assimilated and imparted.²

¹ "Encyclopædia Britannica" (art. "Monachism," Rev. R. F. Littledale), ed. ix, vol. xvi, p. 706.

² See "Encyclopædia Britannica," *op. cit.* See also Berendes, p. 73. . . . "imprimis habetis herbarium Dioscoridis. . . . Post hæc legite Hippocratem atque Galenum lingua Latina conversos," &c.

In their practice mysticism tended to prevail, and though the amulet was condemned, yet the spirit in which it had been employed was countenanced in the case of relics and reliquaries. The dæmoniac theory of disease was a common tenet, and there was much sprinkling of holy water, invocation of saints, and casting out. The nomenclature of medicinal plants at this time is characterised by the introduction of sacred names, such as *Oculus Christi*, *Rosa S. Mariæ*, *Herba Catherinæ*, &c.,¹ and disease here and there is placed under the tutelage of particular saints; St. Anthony's fire and St. Vitus' dance still linger with us in memory of those times.

The ninth century is illumined by the personality of Charlemagne, whose greatness is before all things shown by his educational endeavours and his encouragement of learning generally: the labours of Alcuin of York figure prominently under Charlemagne. The soil demanded, however, much preparation, and these efforts must be regarded chiefly in that light, viz., as preparatory. Neither in this century nor in the next does medicine make any noteworthy advance; it is, as Berendes says, in the hands of the clergy (in particular of the monks), and it consists of a healing with popular remedies, assisted by invocation.²

Enlightenment is nearing; the desire to impart must have been accompanied by the desire to know, or it could not have taken root; indeed, the question *why* must ever have been the great antecedent: of

¹ See Berendes, p. 75.

² *Loc. cit.*, p. 76.

all things growing in the Garden of Eden, did not the tree of knowledge attract most irresistibly? With the dawn of the twelfth century the Universities begin to arise, and so spontaneous, so general is the uprising in Italy, in France, in England, that it is as if a beneficent Hand had planted them overnight: these are the beanstalks up which Jack is to mount to the stars. The Universities which thus arose were all of them ecclesiastical foundations, in direct descent from the cathedral and monastic schools, whose scholars when they met and greeted each other with the question, "*Es tu scholaris?*" would cross the forefingers in acknowledgment of the supremacy of this symbol of their religion;¹ but, curiously enough, this was not the first beginning of academic life, for long before—somewhere in the ninth century, that of Charlemagne—there existed at Salerno in Mid-Italy, a University, the constitution of which seems to have been entirely secular; this is the celebrated University of Salerno, which was so renowned for its medical authority that it earned for itself the title of *civitas Hippocratica*. Very remarkable about this University is the fact that medicine appears to be the leading faculty, taking precedence over law; remarkable also the tolerance of this *civitas*, for not only might Jews—though at that time a universally persecuted race—take an honoured position as teachers, but women also could rise to dignity and even to the professorial chair. From the School of Salerno issued

¹ Gustav Freytag. "Die Ahnen," vol. ii. "Das Nest der Zaunkönige," p. 219.

the *Regimen Sanitatis Salerni*, a rule of health intended for the people, and greatly prized throughout the civilised world of the West even down to comparatively modern times. Diet, the Influence of the mind upon the body, and Rest, as essential factors in the regulation of health, are so prominent in their operation that they stand as the three physicians of Salerno—Doctors Diet, Merryman, and Quiet. Other physicians, however, are called in, and Hygiene is in high repute; indeed, the value of the open-air treatment of the present day might almost take for its motto the lines which set forth the qualities of the air which are necessary to health—

“Aër sit mundus, habitabilis, ac luminosus,
Nec sit infectus, nec olens foetore cloacae.”¹

Nor is medicine itself neglected; on the contrary, exaggerated views of its powers are held, as the line declares—

“Cur moritur homo, cui crescit salvia in horto?”²

Salvia may here do duty for the whole medicine-chest, “*Salvia salvatrix, natura consiliatrix*” (should it not be “*consolatrix*”?)—such virtues dwelled in sage; but other healing herbs grew in the apothecaries’ gardens of those days, and, lest the physician should be too puffed up by the authority over

¹ “Let the air be clean, habitable, and luminous, in no wise contaminated nor smelling of drains.”

² “How comes it that man dies, in whose garden *Salvia* groweth?”

disease which these gave into his hand, the above question is followed by the words—

“Contra vim mortis, non est medicamen in hortis.”¹

Medicaments, therefore, flourished under the Salernitan rule.

The earlier period of the University of Salerno falls before the introduction of Arabian medicine, but later on this finds an entrance and a welcome. The University of Salerno seems to have stood very much by itself; it was no part of a general movement, and in this respect contrasts markedly with the later Universities, the upspringing of which in the early years of the twelfth century began a new era—that of Scholasticism. Europe and the territories immediately adjoining Europe were at that time in a highly electric state. In Asia Minor—in Palestine particularly—throughout the long coast-strip of Northern Africa, named Barbary, and in Southern Spain, Mohammedanism was supreme; like a huge thundercloud rolled up from the East and South, it brooded over the Mediterranean waters and confronted cloud-cumuli as menacing which had slowly gathered in the North and West. The inevitable storm burst; the Crusades began: at intervals from 1096 to 1270 the lightnings streamed across the Mediterranean, positive and negative joining issue in a fierce heat which spread desolation. “Dark clouds bring

¹ “Against the power of Death, no herb in all the gardens availeth.”

waters though the bright bring none," says John Bunyan, and this fury of conflict brought showers of fructifying thought, for it brought contact of mind with mind. True, the contact was still at the sword's point, but it was upon so large a scale that the edge of the sword, multiplied almost indefinitely, became a bridge broad enough for the feet of knowledge to tread. Conquests here, lodgements there, the ceaseless interchange of prisoners—these were the means, and Arab learning enters, this time in a shirt of mail, bringing with it amongst other treasures τὸ φάρμακον. It is in Latin garb that this learning comes, in the shape of translations from the Arabic, and, strange to say, very largely through the scholarship of a race despised by East and West alike—the Jews. The reigns of Frederick Barbarossa and Frederick the Second of the Hohenstaufen line fall in this period, and both of them showed marked Oriental leanings, the latter being accompanied on his expeditions by his own Arab body-physicians. The encouragement and example of these great potentates give an appreciable impulse to the study of Oriental lore.¹

Averroes and Avicenna enter the schools,²

¹ See Gustav Freytag, "Die Brüder vom Deutschen Hause" ("Die Ahnen").

² It is more than probable that earlier Latin versions of Avicenna had existed, and that these had found their way into Salerno before the time of Constantinus Africanus, *i.e.*, before 1050; if so, these versions have been lost. "Encyclopædia Britannica," ed. ix (art. "Universities," J. Bass Mullinger, M.A.), vol. xxiii, p. 832.

the former as the exponent of Aristotle, the latter of Hippocrates and of Galen, but the Schools as they find them are already absorbed in the subtleties of dialecticism, and their advent does not check the wranglings of the Schoolmen.¹ Major and minor premises hurtle through the air, and, forgetful that in Science at any rate it may be necessary first to establish these premises in fact, the Schoolmen pursue their conclusions with the utmost refinement of argument—rich crops of these are raised, but they are as illusory as the seed sown was phantastic.

Among the Universities, that of Montpellier acquires early its special fame as a Medical School, and as it grows in importance Salerno begins to wane. Students from all parts flock hither, and Montpellier is still a great centre of attraction in the early part of the seventeenth century, where and when, attentive to the lectures of Lazare Rivière, we find our own Sir Thomas Browne on the student's bench;² as he listens, the rich imagery of the "Religio Medici" develops subconsciously within. This was in 1630; but this is to anticipate, for the next momentous fact is that of the Revival of Learning, the Renaissance—literally a New Birth.

Foreshadowed by Petrarch³ (1304–1374), himself at one time a student-at-law in the University

¹ *Loc. cit.*, p. 834.

² "Sir Thomas Browne," Edmund Gosse, p. 12.

³ "Encyclopædia Britannica" (art. "Petrarch," by J. Addington Symonds), vol. xviii, p. 706.

of Montpellier, the Revival of Learning did not begin in real earnest until the latter half of the fifteenth century. So far as medicine is concerned this revival led, in the first instance, to the production of physicians who were men learned in letters—Medical Humanists, as Dr. Payne calls them—rather than to any great advance in medicine itself; but in reviving Galen it revived the study of anatomy; in unearthing Dioscorides it led directly to the investigation of medical plants, and, further, by taking men's minds straight back to the Greek originals, it began that struggle between the thing itself, Greek thought, and its Arabic gloss, which was bound to end in the triumph of the former, though more than a hundred years should elapse before the final fall of Arabic medicine.¹

The Renaissance, however, brought with it something more than a mere revival of learning; this in itself might have meant little more than the substitution of one authority for another, as, for instance, in medicine Hippocrates and Galen in the place of Avicenna and Mesua; it did this indeed, but it did much more: it introduced the spirit of questioning, and this once abroad stalked the earth with giant strides. Now a New World terrestrial appeared on the horizon and an Old World of thought was brought back to life; one

¹ On the engraved title-page of the 1st edition of the "London Pharmacopœia" Mesua and Avicenna still figure, but in niches subordinate to those which hold Hippocrates and Galen.

system of science long supreme was now being challenged in favour of an older system—a system deriving from a purer source; in every direction change was manifest, and it was most natural that, once started, the questioning spirit should become the doubting, and should proceed yet further and ask of Authority in every shape and form, Is this the Truth that now cometh, “or do we look for Another”? The foundations of belief, religious, philosophic, scientific, were upheaved.

The oddest of figures now lifts the latch and presents itself, by name Theophrastus Bombast von Hohenheim, or, in brief, as the world knows him, Paracelsus. As we see him depicted at the age of forty-seven, the year before his death, in aspect prematurely aged, of troubled countenance, his hand upon his sword, and overhead his life's motto—*Alterius non sit qui suus esse potest*—we look upon a fighter, perhaps no longer confident, but still militant.¹ The atmosphere in which this man lived was one of continuous struggle, discord was the air he breathed; he was the embodiment of provocation, his a nature in revolt against Authority, and the more so as it should happen to wear the cap and gown of tradition clothing a personality void of real life. A vagrant, a tramp, he had visited many lands in search of knowledge, whilst respectable mediocrity at home was comfortably ensconced in the chimney-corner; from Lithuania, Holland, Hungary, Dalmatia,

¹ “Leben u. Persönlichkeit von Theophrastus Paracelsus,” Franz Strunz, 1903, p. 74.

Croatia, *Rodiss (sic)*, Italy, France, Spain, Portugal, England, Denmark, and all the German lands ("*allen Teutschen Landen*"), he had gathered experience with great toil, only to be mocked at and ridiculed by those who covered their folly "*mit roten Hütlen und Talaren.*"¹ As one reads it is not possible to doubt that here was one whom the spirit of Inquiry moved to the depths of his being, whose goal was Truth, and whose splendid faith in the revelations of God in nature never wavered—the flame of this faith and courage burned steady. That there was another side to this man there can be as little doubt—arrogant, contemptuous, aggressive, he courted and secured the hostility of all who ventured to question his innovations. It was soon after his establishment in Basle and somewhere about the year 1527 that the dramatic episode of the burning of the Canon of Avicenna took place, in public.² Incendiarism seems to have been in the air, for only seven years previously, viz., in 1520, Luther had burned the Pope's bull of excommunication, and now this sign-manual of the popedom of Avicenna suffers a like fate at the hands of Paracelsus. Assuredly this man would brook no authority; his motto should hold, he would be his own man, not Avicenna's nor another's, not even Galen's—yes, one there was who might and who

¹ "Leben u. Persönlichkeit von Theophrastus Paracelsus," Franz Strunz, 1903, pp. 33 and 52.

² *Ibid.*, p. 55: "Auff dass alles unglück mit dem Rauch inn Lufft gang."

did claim his complete allegiance, and this one was Nature; her he would follow from land to land as she might beckon, and it was to learn her ways that he bent his steps. Pathetically eloquent are his words in defence of his peregrinations: "They who sit in the chimney-corner, they fare sumptuously; they who follow Science, lean indeed is their diet"; and again: "They who dwell within the city's close, theirs is every luxury; they who follow Science, if the tree were not, they had not even its shade (to their solace)."¹ Each country was to Paracelsus a page in Nature's book, with which direct acquaintance must be made; each was individual and must speak for itself: thus only could the searcher discover *Codex Naturæ*.² Raleigh is still more than half a century distant, his soul waiting to "give the world the lie," but so far as "Arts and Schools" were concerned this had been done already and most effectively by Paracelsus, and though he had done nothing more than this, and

¹ "Leben u. Persönlichkeit von Theophrastus Paracelsus," Franz Strunz, 1903, p. 40: "Die hinder dem Ofen sitzen essen Rebhüner und die den Künsten nachziehen essen ein Milchsuppen . . . Die in der Rinckmaur haben Kaltes und Warmes, wie sie wollen, die in Künsten, wan der Baum nicht wer, sie hetten nicht ein Schatten." It is not pretended that the above is a literal translation, but it conveys the meaning. The word *Kunst*, as here used, must be rendered *Science*, or if *Art*, then it must be in the sense in which Hippocrates used it in his aphorism, "Art is long," &c.

² *Ibid.*, pp. 40 and 38: "Die Engelendischen H'mores sind nit Ungerisch, noch die Neapolitanischen Prewsisch."

nothing less could have sufficed to break through the encrusted formalism of the time, he would have deserved well of his generation and of those to follow; but he did more, for the two words *Codex Naturæ* epitomise an inestimable service.

Paracelsus had his own theory of the universe: he taught, if we may take as sufficient for our purpose the brief summary of Dr. Payne in the "Encyclopædia Britannica" (art. "Medicine"), vol. xv, p. 809, that the human body was a "microcosm"—so it is—containing within itself all parts of that outer world, the "macrocosm"—sun, moon, and stars, and the poles of heaven; so it does, and to assure ourselves thereof we have only to look upwards, for there in narrowest compass upon the fields of the retinae is their splendour painted, there are we in touch with the macrocosm and subject to its influence. Life for him was a perpetual germinative process, controlled by an indwelling spirit, the Archæus—do we doubt this, we who have sown a seed and seen upspring the fashion of a flower? "Diseases, according to the mystical conception of Paracelsus, were not natural but spiritual." Here, indeed, is matter for disputation, but at any rate in this twentieth century we shall concede to the spirit a part in the genesis of disease. "Nature was sufficient for the cure of most diseases;" this was certainly not to underrate the power of the *vis medicatrix naturæ* which we all admit; but he found a place for the art of medicine in that minority of instances where Nature was insufficient. That

art consisted in the exhibition of some remedy which should antagonise "the spiritual seed of disease"; such means were *arcana*, or specific remedies; well, and is not our most modern conception of a remedy, an antidote—*e.g.*, the antitoxin of diphtheria, to be particular—and spiritual or natural, need we labour the point?

The doctrine of "signatures" we owe, it seems, to Paracelsus; the doctrine, *i.e.*, that natural objects show in their outward form the indications of their usefulness—that, in other words, they label or sign themselves. These "signatures," if they exist, have yet to be deciphered—his reading was undoubtedly fanciful, not to say phantastic. Paracelsus was looked upon as an alchemist, but if he was he had a much nobler conception of the philosopher's stone than the race at large—the true gold and silver which he sought to obtain was not these mere metals, but those potencies which could be utilised against disease—his alchemy, indeed, was the chemistry or pharmacology of the present day.¹ His teaching as to the meaning of "poison" holds absolutely, *viz.*, that "All things are poison, and nothing is without poison, and that dose alone makes that a thing is not poison."² He introduced many

¹ "Viel haben sich der Alchimey geeussert, sagen es mach Silber und Gold : so ist doch solches hie nicht das fürnemmen, sondern allein de bereitung zu tractiren, was tugent und krefft in der Arzney Sey"; and again : "Nicht als die sagen, Alchimia mache Gold, mache Silber : Hie ist das fürnemmen, mache Arcana, und richte die selbigen gegen den Kranckheiten" (Strunz, *op. cit.*, p. 22).

² *Ibid.*, p. 22.

new remedies, more particularly mineral remedies, such as mercury and antimony compounds; he investigated many other preparations, such as salts of lead, copper, iron, and arsenic; but though busy in the mineral kingdom he did not neglect the organic world, and in his appreciation of opium we may even now re-echo his words when he says: "I have a specific, which I call Laudanum; it is above everything when death threatens." ("Ich hab' ein Arcanum, heiss ich Laudanum, ist über alles, wo es zum Tod reichen will").¹

On the 24th of September, 1541, at the age of forty-eight, Paracelsus yields up his stormy existence despite Laudanum and all other arcana, leaving us his debtors for a valiant life and brave teachings, and among these for none more than for the words *Codex Naturæ*. Doubtless it would be easy to over-estimate his importance as a world-reformer; for his writings, being chiefly in the German language, must for a long time have remained outside the ken of the learned world of those days, and, moreover, everywhere, in every department of thought, reform was then alive: this, however, does not take from his intrinsic value. Chemical medicine certainly dates its importance from his days, and *les échappés de l'école de Paracelse*, as Dr. Sangrado calls them in his bitter lament to Gil Blas over the "brigandage" of the new practitioners, slowly but surely make headway.²

¹ "Das Apothekenwesen," Berendes, p. 123.

² "Gil Blas," livre x, chapitre i.

And now where do we stand? At the beginning of a long and arduous forward movement, which has persisted, however, and has indeed gathered impetus as it has moved, so that it has never been more active and forceful than at the present day. To follow this movement even in outline would be quite outside the possibilities of this sketch, and we must be content to touch here and there upon a peak in the great mountain-chain of illustrious names which reaches from the past up to the present.

At Paracelsus' death Bacon is on the horizon and Harvey behind the scenes, with Descartes soon to follow; and their method?—*Codex Naturæ*. In Harvey's time, viz., at the end of the sixteenth and beginning of the seventeenth century, but in a class by himself, we find the celebrated Van Helmont; into his system chemistry enters, and henceforward we find that both chemistry and physics enter more and more into the conceptions of vital processes and the actions of remedies, whence arise the Iatro-chemical and Iatro-physical schools. Sylvius and Willis take up the tale, and to them succeed Sydenham (the English Hippocrates) and John Locke. The discoveries of Newton in the seventeenth century make their influence felt in the medicine of the eighteenth century, and there follows a further development, viz., of the mathematical or mechanical phase of medicine. About the end of the seventeenth and the first quarter of the eighteenth century the great figures of Boerhaave at Leyden and of Hoffmann and Stahl at Halle are to be noted; they are all three responsible

for systems. To Stahl we owe the theory of "phlogiston" which dominated in chemistry up to the time of Lavoisier : his followers, the Stahlians, so magnify in their practice the potency of the *vis medicatrix naturæ* that this practice "was therefore imbecile, and has been aptly enough denominated '*a meditation upon death.*'" ¹ Haller now arises with his illuminating doctrine of "*irritability*," and about the same time Morgagni gives an immense impulse to morbid anatomy. The two Hunters, William and John, are almost contemporary with the preceding, and with them nature, rather than systems, again becomes dominant. John Hunter founded the great Hunterian Museum, and what is this but *Codex Naturæ* in thousandfold illustration? true, museums have been apt to be misread and to serve rather unto a worshipping of Death instead of a glorifying of Life, for rightly interpreted they indicate not the ways of Death but the steps of Life under difficulties. We have, however, not yet done with systems. The great teacher Cullen is to elaborate his Nosology and John Brown his system, the Brunonian, of *Stimulus*. The Brunonian theory makes a stir and many converts, but it is manifestly insufficient, and to meet its inadequacy the theory of *Contra-Stimulus*, of Rasori and Borda, is evolved. This also passes, and with one notable exception we have done with systems for a long time to come. The nineteenth century is upon us, but it is too near and too abounding in detail for even the most cursory reference. We

¹ Paris, "Pharmacologia," ed. viii, p. 30.

can only repeat the question: "To what has it brought us, and where now do we stand?" Pasteur and Virchow have but recently passed away; Lister is still with us, and Koch; a whole world of minute life has been opened up, and from its study pathology has acquired a new significance, and treatment new remedial weapons. The pioneer work done by Edward Jenner in the eighteenth century is finding its interpretation and its expansion at the hands of numberless workers—and all this, together with its infinite promise of more, is the result of the exploration of *Codex Naturæ*. Therefore, to the end that this triumphant progress may continue, the physician must continue to grow out of Nature—"Darum muss der Arzt aus der Natur wachsen." Paracelsus has said it.¹

Mention has been made of one notable exception to the genesis and exodus of systems, and this sketch should not close without a brief reference to this exception—the system in question is that evolved by Hahnemann and set forth in his "Organon," first published in 1810. We are here presented with a fundamental law governing the application and mode of action of remedies, viz., *similia similibus curantur*; the word Homœopathy embodies this dictum. The idea seems to have presented itself in almost identical words to Paracelsus,² but the merit of its *exclusive* application is certainly Hahnemann's. Homœopathy is still amongst us.

¹ "Leben und Persönlichkeit," Strunz, p. 63.

² See article on Homœopathy, "Encyclopædia Britannica Dr. J. Grey Glover, vol. xii, pp. 126, 127.

A fundamental law is that which we are all in search of. To what does this one lead us? With untold pains medicine has been struggling on towards a union, an incorporation of itself with the rest of Nature—in the workings of the body it sees and endeavours to follow the actions and reactions of natural forces, with which, in physics and in chemistry, it has become acquainted outside the body. The mode of action of these forces within the system it assumes to take place according to the same laws which govern their action outside the body, so that when vitality is put on natural law is not cast off. This is the belief, the faith of modern medicine—viz., in one *Codex Naturæ* for all created things. The child is put to school and it learns that two and two make four and that two from two leaves nothing; it learns that plus and minus quantities added together cancel each other more or less completely according to their equality—according, *i.e.*, to the laws of summation. The child proceeds and studies physics; it learns that momentum is the result of the multiplication of force into mass; that it is impossible to separate force from mass; that momentum of one kind can only be opposed and overcome by momentum of an opposite kind. Again, according to the laws of summation, it learns that when two or more forces are brought to bear upon a given particle these forces, *as they are similar* or resemble each other, *concur* or *co-operate* in their effect; *as they are dissimilar*, *oppose* and *thwart* each other, and this by the law of the composition of forces; further, that all forces are modes of motion, indestructible

as matter itself, and correlated according to a fixed rate of exchange. It passes on to the chemistry class, and learns that acid and base neutralise or cancel each other, whereas acid added to acid or base to base gives increase of acidity or of alkalinity, as the case may be, again and always by the law of summation. It enters upon the study of biology, and is taught that within the living cell the forces of physics and of chemistry are at work according to those same laws which it has learned during its foregoing course of study. True, there is this new and strange thing, vitality, announcing itself by the mystery of germination and of growth, which no laboratory, physical or chemical, has yet evolved; but nothing which has thus far been learnt by watching vitality in being suggests a negation of those natural laws which the, so-called, non-vital world has proclaimed. Now, however, for the first time in the course of his study the student is to learn that within the compass of this living world, more particularly within the bodies of living men, a new law operates whereby like superimposed on like works by subtraction and not by addition. If it should be urged that the action in question is not one of annulment but of displacement or substitution, the drug symptom ousting the natural symptom, the process is equally novel and unintelligible; whilst if the contention be that the application of the law is restricted to the sphere of disease, to the exclusion of the processes of health, then confusion is only worse confounded. But it may be said, How are we to account for this? Here is a morbid per-

turbation of the body, a disease, and here is a drug which causes a perturbation of the body very similar in outward appearance, and we find that this drug duly administered benefits this affection. Where is your explanation? The answer is: Establish your observation in fact, and together we will seek its interpretation. Meantime, until we are in possession of the necessary body of evidence, until the processes of physiology and pathology have been more fully elucidated—until, indeed, biology has made the advances which shall bring it into line with physics and chemistry as a strict science—until that time we shall not even entertain a hypothesis which is so contrary to everything which we have hitherto learned, and which would take medicine out of that unity of Nature in which we so firmly trust. For do we not know how deceitful appearances may be, and how, for instance, we may see the phenomenon of light added to light with darkness for its outcome? Yet what physicist has ever promulgated a law of similars? The patient investigator has been content to probe the phenomenon, and in so doing he has discovered the *law of interference*, according to which two waves of light, identical in quality and quantity of energy, have abolished each other because they have met in *opposite phase*; because, in fact, it has been after all a case of dissimilars and not of similars.

In criticising the doctrine of Homœopathy it must not be forgotten that the law of similars does not stand alone, but is accompanied by the theory of *dynamisation*, that the same mind which begat the

one gave birth to the other also. We are here presented with the theory of the infinitesimal dose, according to which the power of the medicament rises with the subdivision of the dose, provided that the attenuation be accompanied by a shaking or pounding.¹ It is not to the point for the apologist of Homœopathy to assert the power of the minute dose—we know it well, and daily are becoming more familiar with the fact, witness the proportion in which lime salts influence the action of the frog's heart, as Dr. Sydney Ringer has demonstrated in many papers. The point is *that, given a remedial effect, subdivision of dose, however brought about, should raise the potency.* The physicist teaches that momentum is the product of *force* into *mass*, the formula standing $M = fm$ (M =momentum, f =force, m =mass); but now, on this novel doctrine, we are to learn that as we divide and subdivide *m*—and in the early days of Homœopathy this was done without stint to quadrillionths, to decillionths and beyond, even to *olfactions*—*i.e.*, as we reduce the dose, so remedial momentum is to gather! The physicist tells us that force and mass are inseparable, that they are integral parts of momentum; the new doctrine would seem to inculcate that mass is not a vehicle for force, but an encumbrance unto it, to be got rid of as far as possible, and that this dissociation is to be effected by succussion, pulverisa-

¹ See "Encyclopædia Britannica," ed. ix (arts. "Homœopathy" and "Medicine"), vols. xii and xv; see also Pereira, "Materia Medica," ed. iv, vol. i, pp. 126, 127; also Trousseau et Pidoux, "Tarité de Thérapeutique," ed. ix, 1875, Introduction.

tion, dilution—that in this way force is to be freed from its wrappings. Is it possible by any means to bring this teaching into line with modern science? Might it, for instance, be contended that the act of attrition which *dynamises* does so according to the law of the transformation of energy? This would indeed be an expansion of the doctrine of the correlation of forces if the mechanical act of attrition should confer now the virtues of arsenic, now those of opium, and now those of charcoal upon a vanishing quantity (mass). Have we not here, in the words of Trousseau and Pidoux, “un non-sens choquant”?¹ Nonsense indeed, and multiplied to the *n*th power. Add to this a complete disbelief in the *vis medicatrix naturæ*² and we realise the absolute separation between this system and that which, through many vicissitudes, has grown up amongst us from the days of Hippocrates unto the days which now are. Hahnemann held “that allopathy was coarse in its remedial methods because it only knew how to copy Nature.”³ This sentence is illuminating, for avowedly *Codex Naturæ* is the goal of the medicine of Hippocrates and of the present day, whereas *Codex Hahnemannii* rests upon teachings never learned in Dame Nature’s school, and demands mental conceptions out of harmony with those which she approves.

¹ *Op. cit.*, Introduction, p. lxxvii.

² Hahnemann’s own practice of administering the quadrillionth of a grain of carbon or the decillionth of a minim of tincture of opium must, however, have leaned pretty heavily on this same despised *vis medicatrix*; cf. Pereira, *loc. cit.*

³ Trousseau et Pidoux, *op. cit.*, p. lxxx.

These criticisms apply to the *principles* upon which the practice of homœopathy has been up-reared: if they have been discarded, in whole or in part, it is right that we should know this, and exactly where we stand.

In concluding this sketch let us urge that nowhere within the stricter sciences do we see a conflict between fundamental principles: how, indeed, should Science exist upon such mutually destructive terms? Accordingly we must regard it as a grave discredit that there should be the possibility of such a division within the ranks of those who practise medicine, and must allow the only inference deducible, viz., that medicine has not yet attained to the level of an exact science. As we have stated elsewhere, however, Medicine is potentially a science if actually she is not yet such; nor can she fail to arrive at her goal, provided that she found her methods upon the teachings of Nature, upon which all science rests. Until we are all of one mind in this respect there can be no basis for agreement nor any prospect of peace—tolerance would be a confession of indifference upon vital matters. But whilst this is and must be so on questions of principle, in the details of practice there is, unfortunately, ample room for diversity, and even for apparent divergence, and it is possible even that two theories conflicting at the core may seem to cover equally well the observed facts. Such conflict has not been unknown in the domain of the stricter sciences—as,

for instance, when the Newtonian propulsive theory of light contended with the undulatory theory. In such case what must be done? What else but follow the example set in that very instance, viz., bring the contention into the court of Nature and abide by her pronouncement upon a test case. The test case in that instance was refraction, and upon the findings of the behaviour of light under the conditions set by experiment the wave theory of light was established, and Newton's theory disappeared. Let us, then, concede that Nature shall be the court of appeal; her codex our codex; let the appeal itself be experiment, and let the results of experiment stand, as Nature's pronouncement, unquestioned and unquestionable—let this be the frame of mind in which we are prepared to approach matters in dispute, and all will be well. We need not fear any dead level of monotonous agreement, for in medicine, if anywhere in the world of knowledge, we realise, with Hippocrates (Aph. I., Section I.), the difficulty of experiment, because of its hazard, and we realise also the fallibility of judgment. Here is room for a generous tolerance both in matters of opinion and of practice, so long as the mind is set right and points in one direction.

Is it an unreasonable hope that we are within sight of such unanimity, and that henceforward the physician shall continue to "grow out of Nature"?

DEFINITIONS

TO look at, the word *drug* is somewhat ill-favoured; in the utterance it is harsh, not to say uncouth. Its structure does not suggest a Latin origin, though the Italians have it, and the Spaniards, and both have done their best to deliver it from its guttural bondage and give it the liberty of the tongue. It derives, we are told, from a Dutch word *droog*, which through the Anglo-Saxon stands related to our own word *dry*, and thus it justifies its asperous exterior.

Primarily the word signifies the contents of the pharmacy; any medicine, in fact—animal, vegetable, or mineral—of which use is made in the treatment of disease. Shakespeare uses the term *drug* in a sense now obsolete, viz., as synonymous with *drudge*, and we may with advantage recall this use, since the services rendered by drugs may often be regarded as toilsome and even menial, though we would not say unwilling—certain it is that the recognition accorded to drugs by the many is in keeping with this view of the assistance which they render, and scant the thanks

which they receive : yet do they yeoman's service in the cause of health.

How, more strictly, shall we define the drug? In one word as *medicine*, but when we come to examine into this synonym we meet with real difficulties in so framing the definition that it shall include those things only which we have in mind when we use the term.

The first difficulty arises when we try to distinguish between the drug, or medicine, and the poison; *i.e.*, between that which cures and that which kills. On the face of it the distinction would appear to be of the simplest, and to depend upon a fundamental qualitative divergence—the drug remedial, the poison lethal; but further investigation discovers that the difference is not qualitative at all, but quantitative only, and that a question of less or more alone separates.

A greater or less intensity of action characterises every form of matter in its infinitude of presentments, from the sluggishness of the most indolent of colloids to the celerity of the most nimble of crystalloids. Unto this scale of activities the human body is offered, and the reaction which ensues, as this or that activity takes effect, labels the same as harmful or beneficent; but no molecular grouping has yet been found whose intensity of action could not be so tempered by dilution as to lose its sting, though we may not in all cases have learnt to convert the deleterious influence into the effect desirable. In not a few instances, however, this transformation has been

achieved—as, for example, in the case of prussic acid. This combination of carbon, hydrogen, and nitrogen takes rank amongst the most deadly of poisons, not so much by reason of the smallness of the dose, though it is estimated that a grain or a grain and a half of the pure acid may kill, as by the rapidity with which it operates, and which is so great that it gains upon certain other poisons which in mass-effectiveness have the advantage. This hostile substance may nevertheless be so tamed by subdivision that it may be administered not only without fear, but with great benefit, and thus it comes to pass that prussic acid finds a place in the pharmacopœias of the nations.

To give another instance, we possess in the common white arsenic, or arsenious oxide of the chemist, a very powerfully acting body. Of this two grains have proved fatal, yet, the dose sufficiently reduced, *i.e.*, the administration controlled, and the poison is transformed into one of the most proved and energetic of medicines.

By quantitative regulation the most virulent of poisons may be converted into the useful medicament, and it is interesting to note that in many cases, perhaps in all, the passage from the one form of potency into the other is direct. That is to say, there is no mid-point of neutrality, no vanishing-point of toxic action which itself becomes the starting-point of therapeutic action.

A simple diagram will best illustrate this relationship of activity to dose.

Let the height of line A B represent the toxicity

of a given dose of arsenic ; then, as the dose is reduced, the toxicity will fall until an intensity of action measured by $A_1 B_1$ is reached, which intensity marks the transition from toxic to therapeutic action. The reduction of the dose proceeding, with it the therapeutic intensity falls, until a level of potency measured by $A_2 B_2$ is attained, at which level therapeutic action ceases to be recognisable. Thence onwards, till the point of no dose is reached at O, we are without evidence of action of any kind, though, of course, action there is, and in decreasing

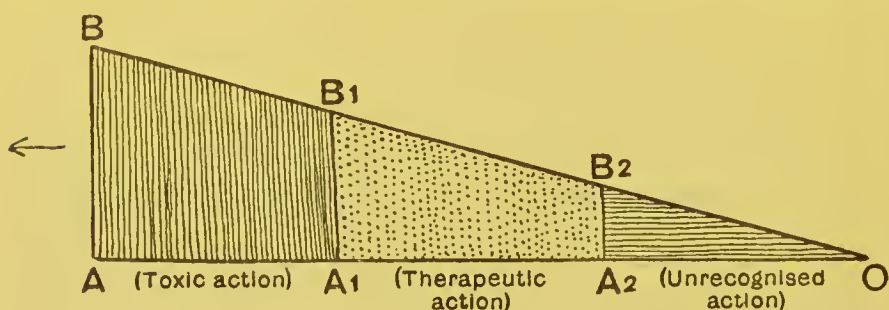


FIG. I.

quantity, until the zero-point is arrived at. The position of the line $A_2 B_2$, when therapeutic action first appears, is a varying one for each person according to the individual susceptibility, which at times is so marked that we label it idiosyncrasy ; and in like manner the line $A_1 B_1$ will shift this way and that, towards or from O, with the change from this individual to that. A high degree of susceptibility to the toxic influence of a drug is again labelled idiosyncrasy, as, for instance, when the mere application of a belladonna plaster dilates the pupil and dries the mouth or when a minimal

dose of potassium iodide excites a running at eyes and nose.

We have no reason to think that the line which represents the gradient of activity is necessarily straight—it is more than probable that at times a curved line may represent this rise and fall, as, for example, in Fig. 2; this, however, will make no difference in principle, and the foregoing remarks will apply equally.

Substances in the act of being generated are spoken of as being in the *nascent* state; thus, if

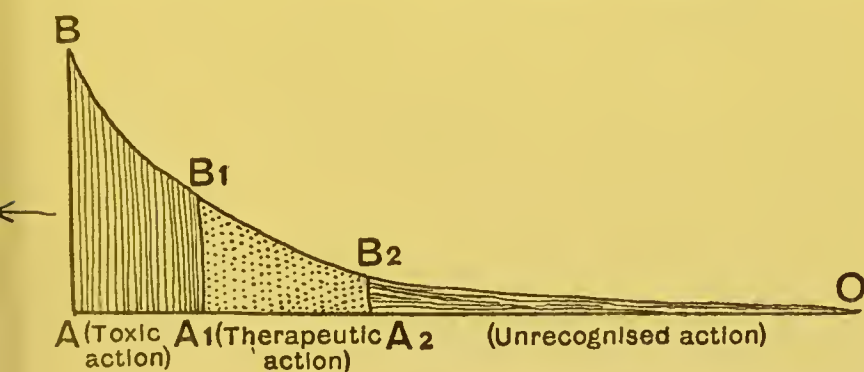


FIG. 2.

hydrogen be generated by the action of metallic zinc on dilute sulphuric acid, the gas, whilst escaping from its confinement within the sulphuric molecule, is described as nascent hydrogen. Such newly formed hydrogen is more active than that which has been some time in being, just as carbon which has just been formed is more active than after keeping.¹ Whatever, therefore, the curve of

¹ As to a suggested explanation of the reason of the greater potency of the *nascent* state, see paper by the writer "On the Action of Bodies in the Particulate State," *Folia Therapeutica*, April and July, 1908.

activity of a given substance in the ordinary state, that curve will show a steeper gradient in the nascent state. This fact of the quickening influence which belongs to the *status nascens* will in no wise affect the argument already set forth, and the conclusion will stand that between the drug and the poison, dose, and dose alone, is the determinant.

“Zwei Tröpflein machen rot
Zehn Tropfen machen tot.”

We must next discuss another definition, that, viz., of food, and inquire whether it—the aliment—can be satisfactorily labelled and set apart, or whether here also difficulties may arise in its separation from other substances, and, in particular, from “the drug.”

A food may be defined as a substance the supply of which is necessary to the maintenance of the vital functions. According to its derivation it signifies to nourish, *i.e.*, to support life. Such a substance serves either to furnish the plastic elements out of which the living organism is moulded, or it serves to liberate the energy necessary to the fashioning and working of the tissues, or it does both. It presents the material, it brings the energy, out of which the living thing grows and by which the living thing works. In these two directions it shows us that indissoluble union of matter and of force from which, in this universe, we cannot get away; but in order to be thus utilised food must suffer change, and this change is generally regarded as essential to the

act of nourishment. Is this so? The question is crucial.

A necessary element in every diet is common salt. Administered with the foodstuffs it is absorbed into the system and circulates everywhere; upon this it leaves the body, for there is no accumulation of salt within the tissues. But this substance, the sodium chloride of the chemist, is a very stable compound, and there is nothing to show that it suffers decomposition whilst in the system; on the contrary, we have every reason to believe that of one hundred grains of sodium chloride administered, the whole quantity, to the last particle, could be recovered intact, as it leaves the body, if our means of collection and of estimation were sufficiently accurate. If this be so we should require much persuasion to believe that decomposition in any form did actually take place after absorption, for such decomposition would necessitate recombination before the salt left the tissues, whence, in the end, the net gain to the economy of this undoing and doing would be *nil*. Nature is not wont to engage in unproductive labour, and we are justified, therefore, in assuming that she has made no exception in this case. From every point of view, then, it is clear that sodium chloride supplies no energy.

Does it serve a plastic purpose? Of this also we lack evidence, and, moreover, it is unlikely, for the rate at which these quickly moving crystalloids slip through the tissues does not suggest a building up, nor even a temporary association with the physical inertia of the tissue-colloid.

Admitting, then, that common salt is a necessary ingredient of our diet, we are compelled to widen our definition of the word "food" so that it may include not only the force-bearing element and the formative element, but also the element which in some way—obscure, yet undeniable—*conditions favourably* the vital process. In the same way, therefore, that a given temperature level is essential to vital manifestation, though this fixity of level means neither the supply nor the withdrawal of energy from the process, so the presence of a given percentage of sodium chloride in the fluids and the tissues of the body appears to be essential to their vitality.

The term *catalysis* or *catalytic action* has been given to describe the influence of substances which, though indispensable to a given process, do not appear to take part in that process. A *rôle*, for instance, such as that played by sulphuric acid in the process of etherification. It was the great merit of the late Professor Alexander Williamson to make plain how action of this kind might be viewed, viz., as a carrier, or go-between, operation. Of such action the inorganic world presents us with another familiar instance in the manufacture of sulphuric acid itself out of sulphurous acid and oxygen, by means of nitric oxide acting as a vehicle. In the organic world the part played by chlorophyll in plants and the hæmoglobin of the red corpuscle in animals, gives us another example of similar working, and we conceive the action of many of the ferments to be not improbably of like nature.

The old idea, therefore, of catalysis as a presence action, in which the catalytic substance, after the manner of an onlooker, produced its effect without participating in the act, has given way to a more rational conception. Whether the part played by sodium chloride in the tissues is of like kind we may leave for the present, contenting ourselves with recognising it as a factor which *conditions* of necessity the vital process, and consequently must find a place in the aliment.

Accordingly, we have reached this stage, that a food may be either *plastic*, or *dynamic*, or *conditional*, or it may combine these qualities.

Let us now turn to the tables of contents of our pharmacopœias and test each substance therein enrolled by these food-qualifications. At once we light upon members such as cod-liver oil and malt extract, indubitable foods, both plastic and force-bearing, yet undeniable medicines, since in either we see qualities which are specific, due to ingredients also specific, and which impart—to the oily substance in the one case, and to the saccharine substance in the other—definite medicinal virtues. Pursuing our research, we meet with a prescription of British Pharmacopœia fame, dedicated in particular to those who cannot tolerate eggs and whose consciences will not allow alcohol (*Mistura Spiritus Vini Gallici*): in it we find a preparation invaluable both as food and stimulant in certain cases of prostration. Nor may we overlook alcohol—the much maligned—for in it we must recognise the food, now that physiology has definitely established that it is

burnt within the tissues and that the act of burning means the liberation of energy. As a force supplier, therefore, alcohol is a food, though *in comparison* with other aliments it must be admitted, for reasons, that it is a bad food: good or bad, however, it is not possible on scientific grounds to exclude it from this class.

Another member of the pharmacopœias presents itself—*glycerin*. This syrupy liquid mixes freely with water, and it finds ready access to the tissues. After absorption it has been shown that it undergoes oxidation, therewith liberating force, and accordingly, like alcohol, it is *pro tanto* a food. Its food value, however, appears to be relatively small, and not comparable with the nutritional worth it acquires by combination with a fatty acid to form an oil or fat.

Of course, it is not sufficient for any given substance to show that it is capable of oxidation and of setting free energy in the act; it is necessary to show that the cremation can take place within the tissues before we can establish the food-claim. Tried by this test, it would appear that the petroleum (paraffins), which have been much used of late as carriers of medicines, and which themselves are absorbed, are not foods, physiology teaching that the combustion energy of which they stand possessed cannot be unlocked within the tissues because these do not present the conditions requisite. The paraffins, therefore, make good their word-significance—*parum affinis*—so far, at least, as the body is concerned.

Enough has perhaps been said on the food-medicaments proper of the pharmacopœia, but before quitting the subject we may with advantage ask how we are to classify such preparations as peptonised milk and the whole group of the predigested foods, and even such a preparation as Koumiss. Foods, clearly, they are; but, inasmuch as they are adapted to meet states of the body which are distinctly morbid, it would be difficult to deny their claim to be considered as medicines also.

The pharmacopœias, then, contain medicines which are undoubted foods, plastic and force-bearing; but these are the exceptions, and the great body of pharmaceutical products must base their claim to be of the same nature as foods upon other grounds, viz., that they bring conditions which favour the vital processes. Their claim, indeed, is the same as the claim of sodium chloride, and who, allowing the validity of this claim, will be bold enough to deny to sodium bromide that which is accorded to a substance so closely related by structure? Of sodium chloride it is asserted that it supplies neither force nor plasma, but that it *conditions* favourably in health; of sodium bromide it is claimed that, though devoid of energy, though lacking the quality of the potter's clay, *i.e.*, the fictile element, yet it also *conditions* favourably; now, however, it is in disease, not health, that its efficacy is made manifest.

Broadly stated, this is the position taken up—that medicines are foods to the sick body, and

that as the requirements of the organism in disease do not differ essentially from those in health, so there is no essential difference in nature between the elements which uphold life in the one state and in the other: between the food and the medicine, therefore, it is not possible to draw the dividing line.

In what way, more precisely, medicines claim to *condition* favourably we must leave another chapter to develop.

We must now approach the subject of drugs from another point of view, viz., their structure and their sources. The three kingdoms of Nature supply us with medicines; we have those of mineral origin and those which derive from the organic world, both vegetable and animal. The same is true of foods; they come to us from the same sources, and if the aliments from the organic world bulk larger in the eye, this is no true measure of the part played by them as compared with the aliments which we recognise as mineral in origin. We have drawn attention to the value of sodium chloride, but numerous other salts are present in the body, and they are probably equally indispensable. These salts are present in greater or less amount in the organic food stuffs, permeating their substance, and, therefore, in point of fact, the organic aliment presents, along with its albumen and albuminoid, its carbohydrate and hydrocarbon, the inorganic compound also, *e.g.*, the base iron, calcium, magnesium, or potassium, &c., in combination as chloride, carbonate, phosphate, sulphate, and the like.

Analysis shows of some of these salts that quantitatively their presence is minimal—they occur in traces only; but again this is no true measure of their effectiveness, as the experiments of Dr. Ringer on the influence of salts of lime and potash have incontestably demonstrated. These experiments have established what might be termed the physiological value of traces, and indirectly they point to the delicacy of the balance which responds to the presence or absence of quantities approaching the infinitesimal. But quantitative differences can form no distinguishing feature, so it is unnecessary to pursue this question of the effective magnitude of this or that element, and therefore we come back to the *qualitative similitude* of the sources of both foods and drugs.

There are men whose faith is unbounded as to that which comes to the table—they have no doubts as to nutritive values; to them the chop is the chop, and the steak the steak. They may admit differences in flavour as dependent on breed and pasturage, but after all they are inclined to regard such distinctions as refinements which appeal to the epicure rather than to the physiologist; else what meaning is attached to the diet scales of hospitals and other institutions which stipulate for so much by weight of meat, potatoes, bread, butter, &c.? When, however, we come to the question of drugs, these dietetic believers are assailed with numberless doubts as to the uniformity of strength and quality of the ingredients of the prescription. For them the swallowing of a pill or draught is an act of

faith passing the powers of belief. They forget that the drug and the article of food both come direct from the laboratory of Nature, and therefore that both present the same credentials, sealed with the same seal. We know truly that both the food and the drug are subject to adulteration, and if the subjects of drug incredulity would only set their scepticism to work to control and avert this great danger we would not quarrel with, but welcome, their attitude of mind; but, the source of the drug guaranteed, its claim upon our faith is the claim of Nature herself.

Why would we doubt the mineral yet trust the vegetable, or why put faith in the sheep and the ox yet distrust the herb out of which these have grown? Is not all flesh grass, and all grass, is it not rooted in the earth? There was a time when the organic world as the seat of vitality was held to be *sui generis*, and the products of its workings veritable arcana, distinct from the products of the inorganic world, inimitable in the absence of life—this time has passed, and out of the recesses of the laboratory of the chemist there now emerge atomic groupings of greater and greater complexity, which reproduce exactly the organic molecule. Two pieces of charcoal ignited by the electric current in an atmosphere of hydrogen become directly associated with the hydrogen to form the simple compound acetylene, C_2H_2 ; this treated with nascent hydrogen in a solution of ammonia associates to itself two more atoms of hydrogen, and ethylene (olefiant gas),

C_2H_4 , arises ; this agitated with sulphuric acid, is directly united with the sulphuric acid with formation of the body ethyl sulphuric acid, $C_2H_6 SO_4$, and this heated in the presence of water breaks up with re-formation of sulphuric acid and liberation of a compound, which in formula, $C_2H_5 OH$, and in substance is identical with that alcohol which, by the process of fermentation, the yeast fungus elaborates from the juice of the grape. This is but an example and a very simple one of the competence of the laboratory, the syntheses of which increase daily in number and in complexity, emulating the activities of living tissues. Moreover, just as we can build up from carbon and hydrogen, and oxygen and nitrogen, so by analysis we can degrade the most complex molecule and find in the end these simplest expressions only, carbon, hydrogen, oxygen, nitrogen, in which lay concealed all the potencies and complexities of working of the molecule in question. In view of this rivalry and of the impossibility of distinguishing between the product of the cell and the product of the retort, we are gradually awakening to the fact that we went strangely astray in our philosophy when we banished life from even the crucible itself.

We are compelled, then, to the conclusion that neither on the grounds of qualities possessed nor on those of source of origin can we make the division absolute between the drug and the food ; and accordingly no apology is needed for the one which the other can forgo, the title which makes

good the claims of the aliment establishing equally the claims of the medicament. It is true, an unbelieving generation has permitted itself to make merry over the rise, decline, and fall of the drug, but the market-place does not escape these fluctuations in human esteem, and what should we expect from an age which has ventured to call in question the food value of beef and of mutton!

The term "Materia Medica" is applied to those medicines the value of which common usage has confirmed; and by common consent it has been agreed to incorporate under the heading of "the Pharmacopœia" those medicines, and those only, the claims of which are allowed to be most valid, their virtues least liable to be called in question. No nation with any claim to civilisation is without its pharmacopœia, and the store set by the pharmacopœias is sufficiently declared by the marketable values of drug-merchandise; witness the traffic in opium and quinine, to mention two instances only. It was Benjamin Franklin, was it not, who said, "If you would know the value of money, try and borrow some," and, in like manner, if you would rightly gauge the esteem in which this or that is held, take note of the price, in hard cash, which men are willing to pay for it: judged by this test drugs hold a high place in the appreciation of mankind.

The Materia Medica has been acquired at one time by chance observation, at another time by

the expectant attention of a mind bent on discovery. Dr. Paris has written that we owe two of our most important drugs, the one to a savage, the other to a madman; he is referring to cinchona bark and mercury, and the madman is Paracelsus. But present-day research tends more and more to establish the greatness of Paracelsus as a man of science and an observer of the true sort, and we may probably claim mercury as the fruit of genuine scientific research. The word "empiricism" in its higher sense, taken back to its derivation, signifies that which is founded upon experiment, trial: the fruits of such empiricism are the genuine fruits of observation. In this sense we could not wish for any higher title than that of empiric, but a lower sense, which has rather gained the upper hand, makes the empiric one who attains no further than a primary crude observation has led him, upon which observation he practises without due discrimination or right use of the reasoning powers, in a word, by rule of thumb: such an one becomes the charlatan and the quack. For either form of empiric the qualities of the medicaments lie to hand for use, right or wrong.

Hippocrates taught "*experimentum periculosum*," and again "*judicium difficile*," and the higher form of empiric, the true physician, will be he who has always in mind the difficulty of forming a right judgment; so best will he minimise the danger of experiment, which in greater or less degree must attend each administration of a remedy. By this

attitude of mind, or its absence, we shall distinguish the true from the false empiric.

In a larger sense the *Materia Medica* might claim to include all material agencies capable of remedial application, and the scourge of the flagellant and the hair-shirt of the anchorite, in assortments, together with the cautery iron and the instruments of electric torment, should be found side by side with the herbalist's store and the serried ranks of chemicals old and new which crowd the shelves of the pharmacy, even down to the omnipotent serum of latest birth. But in the best equipped "store" we should fail to discover so broadminded an eclecticism, and in general we understand by *Materia Medica* some kind of chemical, whether derived from the mineral, vegetable, or animal kingdom. It may seem presumptuous to some that we should venture to name in the same breath the old-fashioned, time-worn chemical, and that newest of new remedies, the serum; but as the mathematician, "reaching heaven by the perpendicular," finds everywhere and always dimension, so the chemist, probing to the heart things material, finds everywhere the chemical; and so the working element in the last found serum is discovered to be a chemical not other in kind than that which from time immemorial, under the symbol \mathcal{R} , has taken its place in the prescription.

Such are drugs, and if in their use we happen to find disappointment, we may be sure that the fault will lie not with them, but with us. Of

course, we shall not make unreasonable demands upon them—not ask them to “pluck from the memory a rooted sorrow, raze out the written troubles of the brain,” or “cleanse the stuff’d bosom of that perilous stuff which weighs upon the heart.” At best they are but ponderables, and able to cope with ponderables. These higher offices belong not to them.

THE OBJECTIVE OF DRUGS

THE objective of drugs is the cure of disease. This is their *raison d'être*. No disease, no drugs, no physician: health makes no demands upon the *Materia Medica*. With the first departure from health, however, the problem of life assumes a new form, and its corollaries are the drug and the prescription. Accordingly, in the study of the medicaments it becomes necessary to look at the end which they have to compass, the task that is set them, and this requires a glance at the phenomena of disease.

In the foregoing we have said that the line between the food and the medicine cannot be drawn scientifically, nor, plain as is the separation in the main, need we search for distinctions, for the simple reason that there is no conflict between the two. The sick man requires food not less than the man in health, nay, sometimes he requires it even more. Disease, it is true, will in many cases necessitate a modification of the diet, in order to make it better adapted to the altered bodily state; and were our knowledge of dietetics less incomplete, it is probable that in many more cases of disease,

if not in all, however trivial, a modification of some kind would be advisable, but such changes would not, and do not, in any way alter the fact that alike in health and disease food is the basis of life. There is therefore no ground of contention between the food and the medicine, the latter coming in merely as an adjunct or auxiliary in certain conditions which we regard as morbid. This view of the case settles at once the relation of the two as to precedence; the aliment must always remain the primary conception, and receive first consideration in the treatment of disease. Then, and not till then, will come the question of the drug.

Not infrequently errors in diet are sufficient alone to account for the ill-health which has arisen, and a readjustment of the dietary leads straight back to health, and is all that is necessary. At other times, whilst we cannot exactly claim that a dietetic change is all that is necessary, yet it may suffice to restore health if the patient is in no particular hurry, and would rather take this route. Thus in the case of the timid and the distrustful, who cannot rid themselves of the notion that the drug is but a poison masquerading in the garments of the just, for such it may be better to forgo the medicine and let the patient reach his destination by an outer circle. It is important to recognise this view of the situation, for it must be remembered that in general it is asked of the physician not merely that he put the patient on the right road to health, but that this road be the shortest way. In the third class of cases, change in diet will

not of itself suffice to bring about recovery, and recourse to medicines becomes imperative.

Leaving, then, the question of diet as a substratum which in the case of every form of disease will be laid first, we must proceed to discuss the purposes for which drugs are employed.

Drugs are used :

1. To prevent or anticipate disease.
2. To cure disease.
3. To prolong life, failing the prospect of cure.
4. To palliate or mitigate the effects of disease.

For instance a traveller, coming into a malarial district, may take a course of quinine as a preventive to render himself less susceptible to the poison. If he happen to contract the disease itself, then by a more energetic course of the same drug he may find in it a cure for his malady. In certain critical stages of heart disease, in which life is imperilled, the timely and judicious use of foxglove may avert the immediate danger by breaking in upon the vicious circle in which the body finds itself, and, a better circulation having been established, life may be greatly prolonged on quiet lines, though cure is not possible. The best example of the fourth class of action of drugs is to be found in the use of, say, opium to overcome pain, or a sleeplessness, the result of pain : such action is often described as purely symptomatic, and as a *façon de parler* it may pass, though it will not bear scientific investigation.

To prevent, to cure, to prolong life, to comfort ; if drugs can claim to do all this, they will need no special pleading to justify their existence.

Disease as known to the ancients is a very different thing from disease as we know it to-day. The same five senses, it is true, take cognisance of the disorder, now as in the remotest past, but perhaps by a sharpening of the wits, certainly by a sharpening of the senses, through the help of instruments specially devised thereto, we have been enabled to penetrate more deeply into the processes of life and to view its minuter workings. In this way we have become aware of certain lower forms of life, the famous microbes, which as constant concomitants of many varieties of sickness have come to be identified with sickness itself. The last word has still to be said upon the true relationship of germs to disease, but it is probable that at their worst the microbes of disease are but a link in a morbid sequence leading up to those particular manifestations to which we have assigned place and rank in our nosologies. Disease is not a germ, nor is a germ disease, it is only one factor in an equation of many factors ; hence the requirements of the case will not be met by tilting at a single factor ; this is too narrow a conception of the nature of the task before us. Disease is a commotion manifesting itself by a group of symptoms, and treatment means the recognition of each of these as parts of the disorder to be combated ; for instance, in fever, the headache, the thirst, the dry skin, the enfeebled digestion, the constipation, the weakened action of

the heart, each and all call for consideration—each is or may be a source of discomfort and an essential part of the whole disease, taking this word at its literal meaning, and by as much as we remove one or other by so much we lessen the disease itself. Conceivably it were possible to meet and overcome all the symptoms of a malady, and this done, what would remain of the sickness in question—shorn of its disabilities, where is it? Moreover, each one of the local perturbations (symptoms) becomes a secondary cause of further disorder by reacting upon the body; thus the headache of fever is not of the nature of a mere “aside” or by-play; the pain is an actual depressant which lowers the plane of vitality and intensifies the disease, and this holds for every one of the symptoms so called. Nay, pushed home to its logical conclusion, the germ itself in its virulence is only a symptom of a morbid antecedent which has conferred upon it the power for evil. Whether this power conferred be of the nature of an increased virulence on the part of the germ or of a diminished resistance on the part of the infected tissues is of no importance for the moment, all that concerns us now being the fact that the germ as a *means of causing disease* is a consequent (symptom) of antecedent conditions. It is necessary to insist upon this real meaning of the word “symptom,” because we hear so much about *symptomatic* treatment on the one hand, and *causal* treatment on the other, as though they differed in kind; in fact a symptom becomes a cause *à la suite*, and a cause traced back is found to be a symptom. Indeed, the

sequence of disease is very much after the manner of the nursery rhyme of the old lady with the recalcitrant pig. The situation made it doubtful whether she would ever get home that night because—the pig wouldn't get over the stile, because—the dog wouldn't bite the pig, because—the stick wouldn't beat the dog; and so on. Her plight was the disease, and its beginnings went far back. In the end a saucer of milk started a salutary activity, which ultimately, by way of stick and dog, reached the pig, and led to its capitulation, and complete recovery from her plight, with the safe arrival home of the old woman. It is a long story, though it might easily have been longer, but the point is, where does causal treatment begin and symptomatic treatment end, and whether we are to advocate treatment of pig, dog, stick, fire, and so forth, on any difference of principle. Surely there is but one principle, viz., to get at any cause or symptom which is readiest of access, recognising that the more remote, the further back, the point of interruption of the morbid sequence, the better, because in pathology the march of events is not in single file as above, but takes place along lines of divergence, of di- or poly-chotomy. The only principle of treatment, then, is to attack the *cause accessible*, wherever situate, but, if choice be permitted, to place this attack *as far back as possible*, in order to save developments.

Further, it is essential that we should be quite clear in our minds as to the meaning of the word "treatment," viz., removal, abolition, annulment—*not*

concealment. To paint a jaundiced patient white, to simulate the blush of health upon the pallid cheek by means of a cosmetic, or by the same means to hide the discolouration of the skin produced by a course of silver nitrate, this would be in no true sense treatment. It would be a make-believe simply, and beneath the counterfeit presentation the symptom would persist unchanged; it is not uncommon, however, to find symptomatic treatment described as though it consisted in a mere hiding away or obscuring of the morbid manifestation.

If on the other hand an anæmia due to a paleness of the blood should be successfully treated by a course of iron, that would be genuine treatment of a symptom; it might or might not be the wisest form of treatment—this would depend upon a correct appreciation of the origin of the anæmia, as, for instance, whether it were due to an impoverished diet, insufficient exercise, hygienic defects, overwork or other transgression, and whether the cause were accessible or not. In any case it would be treatment, and with the correction of the pale blood those secondary effects depending *immediately* upon the deficiency of iron in the corpuscles would fall away. To treat symptomatically, therefore, is never to hide.

The healing art has come to us from out of the remote past, and, as the monster emerging from the deeps brings to the surface traces of the slime whence it rose, so Medicine moving through the ages has brought with her vestiges of that primeval

ooze in which she was engendered, with other records of her long journeyings. A thousand and one signs, still persisting, betray her antiquity of origin : a heathen symbol, relic of astrological lore, still heads the prescription, and still, *mirabile dictu*, the Latin tongue lingers along with other hieroglyphs. Modes of thought as ancient continue to haunt the cerebral cells of us children of the past : with us yet are the Galenists, the Stahlians, the Alchemists, the seekers after the philosopher's stone, the believers in charms and spells ; and hence it comes that side by side with the higher mathematics and the latest developments in physico-chemistry we meet with a belief in the virtues of a potato carried in the pocket against rheumatism, or in the efficacy of a leaden ring worn on the finger to counteract the same complaint. Nor is this credulity manifested by the ignorant alone ; the refined and the cultured, and even the hard-headed man of business, exhibit the same readiness to believe anything and everything. Extremes beget extremes, and we are therefore not surprised to find, together with instances of the grossest credulousness, an incredulity as gross, which refuses to place credence anywhere, and implicitly denies the existence of any utilisable virtues in those products of Nature which make up the *Materia Medica*. In the face of this distrust we shall do well to recall the saying of Dugald Stewart quoted by Dr. Paris, that "unlimited scepticism is as much the child of imbecility as implicit credulity."

Part of the lumber which Medicine has collected

by the way and brought with her from bygone times is to be found in her systems of treatment—these still encumber her movements. What have we to do with homœopathy and allopathy? Once we are in possession of *the* orthopathy it will require no naming. We may therefore, without further comment, pass by the systems of medicine so called; but it is requisite that we should give some attention to a subject which goes by the name of the New, or Newer, Therapeutics. What is this new thing which has appeared amongst us, in the face of which old and tried methods have come to look so stale and outworn?—it is, of course, an outcome of the microbe. Long before we had seen this hidden worker we had surmised his presence; at last the patient search, aided by the multiplication of the powers of the microscope, has been rewarded, and there he is, exposed to view, in general not quite so broad as he is long, but, it would seem, infinitely mischievous. As bacterium, bacillus, spirillum, coccus, we are familiar with his outward appearance. He may be motile or non-motile, spore-bearing or not, but no matter what the form, the essential feature which marks him is the power to multiply. It was this characteristic which made him suspect, for, in those fevers which we have learnt to regard as inseparably associated with the microbe, it was the evidence of the presence of a poison tending to multiply within the system which marked the type of disease. The malady waxed and waned in the individual organism; it outgrew the limits of the infected body, and infecting others, widened

the sphere of its activity. In the community it waxed and waned as formerly it had done in the individual, and its behaviour in small and in large exhibited so strikingly the laws of growth as we knew them in living organisms alone, that the conclusion was fairly reached—here is a living poison.

Since his outward revelation by the microscope he has been much studied. Within the infected tissues and outside the body, planted in various media, his life-history has been followed. His modes of multiplication, his chemical relations with the surrounding media, have been investigated, and in this way his real potency for good or evil has been run to earth, for there are germs benignant as well as germs malignant. This potency is to be found in that which his body elaborates, viz., a definite concrete poison or virtue as the case may be. Now, the law of life does not abrogate the laws of physics, and accordingly, just as we note that in any field of forces the incidence of a new force evokes its opposite by the law of action and reaction, so in the field of forces presented within the body the entry of a new force evokes its opposite, or, in Greek, its antithesis.

After this manner the toxin generated by the poisonous microbe provokes and is opposed by the antitoxin of the tissues: as we have elsewhere endeavoured to express it in the terminology of physics, the antitoxin represents, as it were, the physiological rebound of the tissues. But the antitoxin itself is nothing else than a chemical compound, as is the toxin. The germ, therefore, works by means of a chemical product, and the

infected tissues respond by another chemical product which is antagonistic or antidotal. Thus far, then, neither in action nor in reaction, has the microbe introduced any *new* mode of operation.

True, in having learned to recognise the germ and to set it apart and operate with it, we have gained the power of producing at will the toxin, and so, by making use of the law of reaction, have become enabled to produce at will the antitoxin, to store it and to apply it. But this application is not new, for is it not after the manner of the toxicologist, who takes from his list of antidotes this or that to meet this or that form of poisoning? In the method of application, therefore, as in the use of an antitoxic serum—let us say the antidiphtheritic—there is in no sense a departure from lines of treatment which ages have sanctioned. Have we any reason to think that in chemical constitution the toxin and antitoxin differ essentially from those other products with which the animal and vegetable and even the mineral kingdoms supply us? This question we have already answered in the negative; there is no reason whatever for such belief. It must be allowed that the mode in which the body reacts to infection, overcoming first the disease and then protecting itself against fresh infection by a process we describe as immunising, is fresh knowledge; but, looked into, we are compelled to admit that no new principle is here involved, and that facts previously well known, such as the occurrence in vegetable extracts of opposing active principles, side by side (physo-

stigmine and calabarine in the calabar bean extract, morphine and thebaine in the opium extract), belong, perhaps, to the same category as this presence side by side of toxin and antitoxin in the animal body.¹ More light there is, but it has discovered no *new* thing.

Other "sera," or extracts, there are besides those produced by means of the infective bacteria; they derive from the several organs of the body, and their employment belongs to that department of treatment which has been styled organo-therapy: they also belong to the so-called new therapeutics. There is scarcely a gland or tissue of the body which has not been requisitioned to furnish these extracts; but the best example of the group is the thyroid gland extract, which has established itself definitively as the cure for the disease myxœdema. This new therapeutic venture dates from the discovery that the glands known as ductless glands, *i.e.*, those which give no direct evidence of their activity in the form of a definite secretion which certain ducts convey here or there, as, for instance, the ducts of the liver, of the pancreas, of the salivary glands—that these blind glands, if we may use the term, are centres of great chemical activity, and that by means of the blood-vessels and lymphatics the products of their working are absorbed freely into the system and contribute a share as important to the economy as

¹ The "perhaps" is necessary here, for it is possible that these antagonistic alkaloids are, in some cases, the result of a decomposition caused by the extracting process itself.

that of the glands with ducts. Nay, more ; it is now certain that the last-named organs work similarly *in addition* to that more obvious working which the secretion conveyed by the duct declares. The term "internal secretion" has been given to this gland product for which no manifest duct has been supplied, and, if we may use a simile, we would compare the gland with a duct to the city on a navigable river ; this city's traffic is both by the waterway, manifest to all, and also by routes less conspicuous though not less important, which, along highroad and lane, radiate from every point of the city boundary into the surrounding country. Nor is this contribution to the needs of the body corporate limited to that which the *glands* or organs supply ; every part of the organism, every tissue, even the most inert-seeming, adds without doubt its quatum of energy and serves to uphold the whole.

The principle upon which organo-therapy is applied is this simply, that where disease arises by *default*, through lack, that is, of the effective working of an organ or tissue, this want may be met and the balance restored by means of the extract of the same organ or tissue taken from the body of a healthy animal, such as the ox, the calf, or the sheep.

An ancient practice foreshadowed modern organo-therapy. At that time physiology was but very imperfectly understood, and the foreshadowing presents a grotesque shape to present-day inspection. The feeding of Achilles with the marrow of the bones of lions, as was done by the Centaur Chiron,

seems at first sight a very up-to-date procedure as a means of imparting strength; but we can hardly take it that the marrow used was the red-bone marrow, and it is certain that in theory the virtue of the diet lay in the source of the marrow, viz., from the fiercest of animals, and that the marrow of the ox, calf, or sheep, as now employed, would not have served. In the heart courage resided, and this organ was supposed, therefore, to confer this virtue—of course it must be the heart of a courageous animal: the same belief has obtained among cannibals. A curious practice, exhibiting the germ of modern ideas, consists in the swallowing of the venom of serpents, said to be done by the Bushmen of South Africa; this was in order to gain immunity against the bite of the serpent. This practice, however, belongs to another form of serum treatment to be subsequently alluded to, rather than here.

Admitting to the full the great advances which have been made since these crude ideas prevailed, and also that organo-therapy on a rational basis has only become possible through the later achievements of physiology, yet, when probed to the bottom, what is it that we administer in these extracts severally? A chemical product and nothing else! And, again, this chemical product is not separated from other chemical products by any difference in kind.

Accordingly, when we administer thyroid extract in a case of disease caused by the absence or underworking of the thyroid gland, are we acting

upon any other principle than when we give a salt of iron to meet a deficiency of iron in the blood? If not, where is the boasted superiority of the newer over the older therapeutics?

No, the germ robbed of its chemical potency, what is it to us? Its wriggings, flagellatings, and infinite movings play no part that we know of in the mischief which it works—as little, probably, as the meanderings of the fly on the surface of the body when contrasted with the evil of which he is capable if he happen to have been feeding on some infected ground, and light upon a breach of surface at which the poison which he carries may find entrance.

In like manner the intricacy of structure of this or that organ, which the microscope reveals, concerns us not when we are considering the physiological or pharmacological value of its extract. This the chemist, and not the morphologist, must expound; and in each case he tells us: Here is no new class or order of things remedial. We shall return to this subject later; for the present this must suffice.

Matter, then, in its most elemental forms, as in its most complex combinings, is here for use. From the series, infinite in its extent, we select as experience has taught us, and before us stands the list of drugs, animal extracts, antitoxins, and all, down to elementary carbon and oxygen. Health, *i.e.*, physiology, does not disdain any class of things material, and pathology must follow suit. Here are our drugs, and, Old or New, their objective is ever the same, namely, to combat disease.

THE RATIONAL BASIS OF DRUG TREATMENT

THE theory of drug treatment—that is to say, its reasonableness—must depend first upon the nature of the call which disease makes; then upon the evidence forthcoming that drugs possess that which is called for and can impart it on demand; and thirdly, upon the proof that help once afforded can or may subsequently be withdrawn without detriment, *i.e.*, without bringing back the organism to the state in which it found itself when the call was first made; in other words, that a temporary use may confer a lasting service.

Now the call which disease makes is, in the first instance, a call in *place*, for disease is either *local* or *general*; thus a surface wound, a skin eruption, a sore throat, a gastric ulcer, an inflamed larynx, each is, if not exclusively, yet in the main a local appeal. Can medicinal treatment be correspondingly localised? Clearly in many cases it can, as, for instance, by the medicated compress, the inunction, the pigment, or the gargle, the bismuth draught, the soothing spray. Each one of these measures brings to the part affected its direct influence. When, however, we meet with an affection of a deeply seated

organ not thus directly accessible, such as a failing heart, a sluggish liver, a renal secretion inadequate or vitiated, an unstable nerve centre, the question as to the localisability of treatment is less simple. To reach the organs affected in these instances the medicament must be introduced into the circulation, and once there the heart distributes it impartially to every part of the body, the vascular ramifications alone determining the freer or less free presentation of the drug to this or that part. But if the heart is at fault, is there any necessity to bring the medicinal influence to bear on the lungs and brain as well, or if the liver is sluggish, must the entire muscular system and the blood formative organs receive treatment along with it? Here would be an *impasse* were it not for that remarkable phenomenon, *the selective affinity of drugs*. This shows us that whilst there is an impartial distribution to all the tissues, these same are not equally susceptible to the circulating influence, but according to a relative affinity or indifference, appropriate here, let pass there. The answer, therefore, is in the affirmative: we can localise the effect of drugs after absorption.

Pharmacology offers numerous instances of the selective affinity of the drug or tissue, but, whilst it would be superfluous to enlarge upon the subject, one striking example may be cited. The chief effect of a South American arrow poison known variously as curara, woorara, and woorali, is a general paralysis of all voluntary movements; this paralysis, analysed carefully, is found to depend

upon a benumbing of the terminations of the motor nerves in the muscular fibres. Thus, whilst every part of the nervous system—brain, spinal cord, efferent nerve, afferent nerve, muscle fibre and sensory end organ, are all exposed equally to the poison as it circulates, the part selected for influence is that limited point at which the motor nerve fibre enters the muscle fibre. No doubt other parts of the body are affected by the poison, but the part named is by far the most sensitive—so much so that the influence here characterises specifically the drug. Upon this principle we administer foxglove on account of a failing heart, mercury because of a sluggish liver, caffeine in a case of defective renal secretion, and bromide of potassium for the epileptic seizure, on the ground, namely, of the affinities which these drugs exhibit severally towards the organs in question.

Next, the call which disease makes is in *time*, according as the disorder is *acute* and temporary, or *chronic*, *i.e.*, indefinitely prolonged. These require separate consideration.

The *acute* affection has a more or less determined course of its own, characterised by a turning-point which marks its limit; this point reached, the disease is at an end, and we have only to deal with the after-effects of the storm. At any moment during the course of the disease the strain put upon the organism may become critical and endanger life, therefore, because of the time limitations of the malady, a chief endeavour must be to gain time in the struggle with the hostile

forces of the malady, prolonging our efforts until the natural term of the disorder is reached and the relatively smooth waters of the after-stages present themselves. To weather the critical point is one great aim of the physician in the treatment of acute disease. Now, disease is opposed by the energies stored up within the tissues; these tissues, as they become drained, are replenished by the process of alimentation, which places the pent-up energies of the foods at the disposal of the organism—no need, therefore, to insist upon the necessity for feeding sickness (was it not Graves who desired to have for his epitaph the words, “He fed fevers”?)—but how are medicines to help in cases such as these? Medicines are of many kinds, and, strange to say, and paradoxical as it may sound, the class of drugs to which we have recourse here is the class of stimulants or force-spenders, as we may style them; for a stimulant is a something which incites the part to which it is applied, and in response there is liberated more or less energy: this energy is now utilised in the combating of the disturbance at hand. The stimulant is thus a drain upon the tissues, and it must be clear that this policy of spending can last only so long as the reserve forces hold out. “*Va banque*” is all very well if the purse of Fortunatus is at call, but except this be, there is no other ending than in bankruptcy. It is, however, precisely in the time limitations of the acute disorder that the sense of this use of stimulants will be found to lie, and it is because the organism, if left to itself, would in many cases

succumb to disease *long before its reserve powers were exhausted* that the stimulant is called in. The stimulant, in fact, makes *available* forces not otherwise forthcoming; such, in brief, is its theory and practice. Fever is a typical instance of the acute disorder, and it is in its treatment, perhaps, that we get the best example of the therapeutic value of stimulants, but it is imperative that in their use there should be judgment and a careful appreciation of the reserve forces at command, so far as it is possible to estimate these; as Turner mixed his paints, so we must prescribe our stimulants, "with brains."

As we pass from the acute to the chronic disorder the rule as to the use of stimulants changes, and it may be set down broadly that in proportion as the disease lengthens out beyond certain limits, the advantage of the stimulant becomes more and more questionable. The reason of this has been sufficiently set forth in the foregoing to make it unnecessary to accentuate the dangers of insolvency on the part of the tissues which such practice involves. In the chronic affection, therefore, the stimulant is to be avoided.

This general statement needs qualification, for we are strongly of opinion that, under the conditions of life as they are and must be, some people are better instruments, more effective, through the habitual use of stimulants. Such are the people of low vitality generally, and of low digestive powers particularly. We shall note, however, that

the employment of stimulants is upon an entirely different plan to that which is adopted when in the prostration of a fever we have recourse to this class of drug. In the latter case we administer the stimulant at longer or shorter intervals, and practically without regard to the digestive process. We may, indeed, let the stimulant carry in food, and if it should assist the digestive reflex so much the better, but to assist digestion is not the object in view—our aim is to incite the tissues to a more active resistance to the approaches of disease, and, literally, the stimulant is the spur to the jaded animal. On the other hand, in every case in which the use of the stimulant is made habitual, the digestive process is the one function which must be taken account of, and the taking of the stimulant will be so timed as to stimulate the digestive powers to a greater activity. If this be accomplished, an improved assimilation will more than make up for any expenditure of energy occasioned by the stimulant; this expenditure in fact becomes the means of a direct and more than compensating gain. The *habitual* use of stimulants, if advisable, will hence be always in relation to food; never will it be taken in the intervals between meals to stir up flagging powers.

Disease is not always of the nature of a direct attack upon the vital powers, and when this is not the case there will be no demand for the stimulant. Disease may be simply a disturbed balance due to the withdrawal of some factor which belongs to health. Thus, in the strange affection termed

myxœdema, the failure of health depends upon the destruction of an organ, the thyroid gland. The activities of this gland being in default, a curious degradation of the tissues follows. Now in this case a continuous activity has gradually given place to a persistent defect, and the call which disease makes is correspondingly persistent. It would be unreasonable to expect to be able to cope with a complaint such as this by an occasional course of treatment, and the requirements of the case are accordingly best met by systematic treatment at such intervals as experience will have determined for each individual. This is an example of chronic treatment in response to a chronic call, but then the limitations which apply to the use of stimulants do not apply here.

Disease, indeed, is of many modes, and treatment must be prepared to follow suit to its lead. This *modality* constitutes the third call which disease makes, the question now being *how* drugs may be fitted to meet the call. We have seen that disease may be due to the entry of a new factor, as in the case of the fevers, which, as a class, belong to the larger group of the infections. How these may be combated, in so far as they exhaust the system, we have considered when dealing with stimulants, but such treatment ignores the fact that the new element which has entered and which is causing all the disturbance may itself be *vulnerable*. This has not been lost sight of, and by means of the group of the *antiseptics* we are busily engaged in an attack on the microbe of infection. This attack proving un-

successful, there is the *toxin* by which the germ works its mischief, and to nullify the effects of which the *antitoxins* are now prepared. Disappointed in this, we fall back on the treatment of symptoms, as they are often called, secondary causes as they really are, and in this way we meet a fever by a *febrifuge*, a parched skin by a *diaphoretic*, an insufficient renal secretion by a *diuretic*, a constipation by a *purgative*, and so forth—the *Materia Medica* list presenting us with classes of drugs which, selecting the various organs and influencing them in a plus or minus fashion, are adapted to correct these organs in their departures from health.

Again we meet with bodily states in which no one particular organ appears to be at fault, yet the whole system is lacking in health. For these general states we find drugs whose beneficial influence seems to fall upon the whole system rather than upon any one part: familiar examples of medicaments of this class are iron, arsenic, phosphorus, the last either uncombined or in various combinations. In the action of these it is difficult to exclude action upon the part, but the general impression is of a pervading influence instead of a more restricted action: the above-mentioned drugs are classed as *tonics*. At times the morbid state of the whole body seems to be of the nature of a perversion, rather than of that which we are pleased to call *lack of tone*; for this also we have the remedy in the shape of the *alterative*: mercury, potassium iodide, arsenic, are instances of alteratives. No doubt the alterative works at times by over-

coming a poison which is present, but when this is its mode of action it is a misnomer to call it alterative, for it really is an *antitoxic* agent; at best the word "alterative" is vague in its meaning, and to be discarded at the earliest opportunity. Meanwhile the alterative stands for an influence capable of turning a perverted state of the system and leading it back to a saner condition.

Of departures from health none are more distressing to witness and to bear than those which, arising insidiously in this or that part of the body, in the shape of some innocent-looking nodule or papule, gradually attract and absorb the attention by manifesting the mysterious law of growth, and growth, too, at the expense of the neighbouring parts. We find ourselves then confronted by the tumour. Some examples of this are innocent enough, but others, both by their local effects and by a tendency to infect the body at a distance, show a malignancy which is terrifying. The causation of the tumour is still undiscovered in spite of much labour, and the remedy still waits, but on the face of it there is no reason why the conditions under which it takes origin and enlarges should not be so modifiable by medicines as no longer to furnish surroundings suitable to growth; in which case arrest and retrogression would follow. Until this *anti-neoplastic* remedy is found treatment belongs to the surgeon.

Enough will probably have been said as to the

various modes of disease and as to the claim which medicine makes to have in reserve a corresponding remedial mode of action adapted to each. The *how*, *when*, and *where* of treatment will thus have been illustrated, and the reasonableness of the claim, it is hoped, established. Medicine, of course, must go one step further and perform what she claims, but has she not done this? The answer to this last question forms, however, no part of the present argument, which limits itself to the presentation of a theory of drug action which the mind can accept.

In order not to break the argument in the preceding discussion of the modes of disease, a very few words only were given to antiseptic treatment, notwithstanding its importance as an example of drug service: this deficiency we must now make good. Antiseptic treatment sprang into conscious being with the development of the germ theory of disease, and to Lister in particular are we indebted for the practical application of the theory. No doubt the treatment is not new, but reaches, indeed, far back, even into Homeric times, as when by fire and sulphur Ulysses purged the palace after the slaughter of the thirty suitors. This cleansing, however effective, was in accordance with custom, but this custom was not conscious: it was uninformed, and therefore lacked direction. All this has changed, and now the naked eye no longer suffices to judge of cleanliness, which has acquired a new significance and a new name, to wit, asepsis; to determine this, the aseptic state, first the eye

must be armed with the microscope before it is competent so to do, for the germ, like "the Great adventurer," tends to penetrate into every minutest recess, and no matter how strict the passage, or how withdrawn, "it will find out the way"—and the germ is the quintessence of uncleanness. Where it goes science must be prepared to follow with fire and sword, or the demands of cleanliness will not be met—the chamber not adequately swept and garnished.

The surface of the body, outer and inner (the mouth, throat, alimentary tract, respiratory tract, constitute an inner surface), is everywhere exposed to the approach and attack of the germ. The vitality of the tissues keeps the germ at arm's-length, and whilst health is preserved maintains the supremacy. Depress the vitality and the opportunity of the germ arises and disease makes its lodgment. At first this lodgment is superficial, but from the surface it tends to spread in depth, and once the blood-vessels or the absorbent channels of the lymphatics have been reached, the way to the citadel is opened, and, though resistance is still to be met and overcome, victory hangs in the balance. Infection beginning at the *surface* tends ultimately to become *systemic*. Antisepsis, therefore, has a two-fold task, viz., to cleanse the *surface* of the body and to cleanse the deeper, interstitial parts.

Surgery has attacked, and with great success, the problem of surface cleansing, and she is prepared, if the knife must make a breach and open up a new

surface, to keep that surface as clean as she had previously kept the unbroken surface. This has been the secret of her triumphs, and it has rendered nearly all parts of the body accessible to local treatment.

To Medicine has fallen the problem of deep cleansing, but her success, judged by results, has been very indifferent: this we must allow. Why is this? Why has she failed where Surgery has succeeded so conspicuously? The reason must be sought in the difference in the nature of the problem. Let us suppose that the surgeon has to deal with a wound which he himself has made or which is the result of an accident, and that the wound has become infected. Now, not only is the surface to be cleansed directly under his observation, so that he is able to watch the effects of the local application and graduate its strength to the tolerance of the part, but—and here comes in the superiority of his position—he can usually sacrifice without hesitation the living cells which constitute the surface to be cleansed. That is to say, he can, if the death of the germ require it, kill with impunity the living cells of the tissues in which the germ lies imbedded. Even if he be dealing with a vital organ such as the kidney or the liver, he may sacrifice the cells which line the wound, for if he destroy to the depth of say $\frac{1}{30}$ or $\frac{1}{20}$ of an inch, what proportion of the organ does that constitute? It is quite a negligible quantity: what are a few thousand cells compared with a thousand million? This holds the more certainly because the organs and tissues

are capable of working far in excess of the usual demands made upon them—they can, therefore, afford to disregard small losses.

How different is the case when medicine proposes to attack an infection of the lining membrane of the heart cavities—a malignant endocarditis. The antiseptic which is selected to attempt this task must not only be efficient for the purpose, but it must be innocent towards every other part of the body to which the blood-stream carries it. It will reach the delicate cells of the brain and spinal cord, the cells of the liver, spleen, and kidneys, and of every organ and tissue of the body, and it will touch these cells as closely and in the same strength as the germs of the inflamed lining membrane of the heart—the germs it must kill or inhibit, the cells of the body it must spare.

The endeavours to treat consumption by antiseptics have to confront the same difficulties, and when fairly faced, so insuperable do these appear, that the problem may seem well-nigh insoluble. This, however, is not the case; there is nothing unreasonable in the endeavour; on the contrary, there is great probability that in time the object aimed at will be compassed. The grounds for this belief are the knowledge of the selective affinities which, as we have already seen, the tissues exhibit towards drugs, and the further knowledge that the microbes of disease manifest the same kind of selective affinity. There is therefore nothing impossible or improbable in the search after the germicide which shall be harmless to the tissues

of the organism, nay, we have a striking example of such neutrality in the relation of quinine to the tissues of the body when this drug is administered in the cure of ague; the dose of quinine which will cure or inhibit the malarial organism and so cut short the attack of ague, is practically harmless to the other tissues.

Thus, in the use of antiseptics present and prospective, we reiterate the claim for a rational basis to drug treatment.

THE PSYCHIC BASIS OF DRUG TREATMENT

THE Physicist in his domain takes note everywhere of an action and reaction :— the ray of light impinges on the mirror, the mirror reacts, bending back the ray ; the elastic ball strikes the hard surface, the surface reacts, and manifests its reaction by converting the momentum of incidence into the momentum of the rebound.

The Chemist brings oxygen and hydrogen together under certain conditions, and he sees the action and reaction of the two elements emerge in the compound H_2O , together with the liberation of a given quantity of energy.

The Biologist studies the movements of the white corpuscle of the blood on the warm stage of the microscope and he perceives a behaviour which he can modify as he modifies the quality of the medium which surrounds the leucocyte. He brings in contact with the corpuscle some carbon dust, and he notes the assumption of certain of the particles into the body of the white cell. He proceeds a step further and substitutes for the carbon particle one of the innumerable microbes of

disease, say the bacillus of consumption, and again he witnesses an action which ends in the incorporation of the germ. If he take two such white cells from one person and then compare the activity of the two corpuscles one with the other in respect of samples of germs taken from the same culture, but subjected to certain differences of environment, he notes that there is a difference between the two corpuscles, and that whereas the one has incorporated two germs, the other has incorporated four. He records in this instance a difference in the *reaction* of two corpuscles to the action of modifications of one and the same germ, and upon this he founds a comprehensive theory, one of the latest, the theory of opsonic action.

The Botanist observes well the varying behaviour of his seed as by altering the nature of the soil, the degree of moisture, and the level of the temperature, he varies the environment of the seed.

In all these modes of action and reaction the investigator is unaware of any third element in the problem before him. When, however, as the Zoologist, he comes to regard the behaviour of the higher types of animals under varying surrounding influences, he is not only puzzled by the complexity of the problem which Nature has set him, but he becomes vaguely aware of a *third presence* which enters as a disturbing element into those nice calculations of thrust and counter-thrust which have excited his wonderment. And when as the Anthropologist he comes to the study of man himself, viewed in the light of his own personality, then he

knows that there is a third presence which in all subsequent calculations will claim first consideration: this *tertium quid* is Consciousness writ large.

Having reached this stage, he would try back and be curious as to where and when this new element may have made its appearance in the scale of life. Into this speculation we cannot enter here, but must content ourselves with the fact of the presence of consciousness as an attendant-in-ordinary upon the vital processes of man, and with the endeavour to search out whether, and in what way, this presence is likely to affect that objective action and reaction of the organism and its surroundings which we have just been considering. The term *in ordinary* has been used to qualify the attendance of consciousness upon the vital process, and this is very necessary, because we soon discover that consciousness is not invariably present; it is worth while that we should try to see how this comes to be. The law which governs the objective action and reaction of matter is that formulated for us by Newton; according to it the quantity of reaction is directly proportional to the quantity of action, and however often the operation of a force be repeated, the result will always be the same, provided the quantivalence be the same, and the quality of the incident momentum and of the reacting material. Now, however, the physiologist presents us with a new law, which, without in reality conflicting with Newton's law, declares that in proportion to the frequency of action of a force upon a living tissue

so does the resistance, *i.e.*, reaction, of the tissue diminish. An example will best illustrate this, and we cannot do better than select the music lesson as a simple case in point: at an early stage of the instruction what peripheral goadings are not required to drag forth "the piece," whereas at a later stage, after diligent practice, the same piece, or, for the matter of that, a much more perfect performance, is evoked by a minimal stimulus; the mere touch of the fingers upon the keyboard may now suffice to call forth the music. In either case the cells engaged centrally will be the same; the peripheral structures, nervous and muscular, co-operating in the complicated movements of the fingers will also be the same, but the timid, tentative movements of the beginner will have been exchanged for the forceful precision of the master touch, and, as has been said, the stimulus which elicits will be incomparably less in the latter case.

How do we explain this change in the condition of the central cells, which at the outset respond only to a maximal stimulation and at the finish to a minimal? In a very simple manner, and thus: a force making its way through matter always encounters, and in the passage overcomes, more or less of resistance. Matter thus subjected to the influence of force will, by the law of inertia, tend to remain in that state of lessened resistance which it has been compelled to assume, and accordingly the line of action of the force will offer a line of diminished opposition to any similarly acting force which presents itself. Let us apply this to the nerve-

centre cell (see diagram, p. 97); the stimulus reaching it from the periphery enters and passes through its substance, encountering and overcoming *obiter* more or less resistance, and leaving behind a line of reduced resistance. Each subsequent stimulus of the same kind, arriving by the same nerve fibres, will by preference flow along the same line, overcoming in the act a further quantum of resistance, and in this way establishing gradually a line of *least* resistance. The process thus described is that by which a cell or a group of cells is said to become *organised*, and we speak of the organisation as complete when the line of least resistance has been accomplished. Theoretically there is no end to this breaking down of resistance, and from this point of view organisation never can be complete, for stimuli will always be arriving and it is not possible to conceive of a state in which *no* resistance will be offered to their passage; but practically there is a stage when we may regard the process as complete, and it is the state of consciousness which enables us to fix this stage.

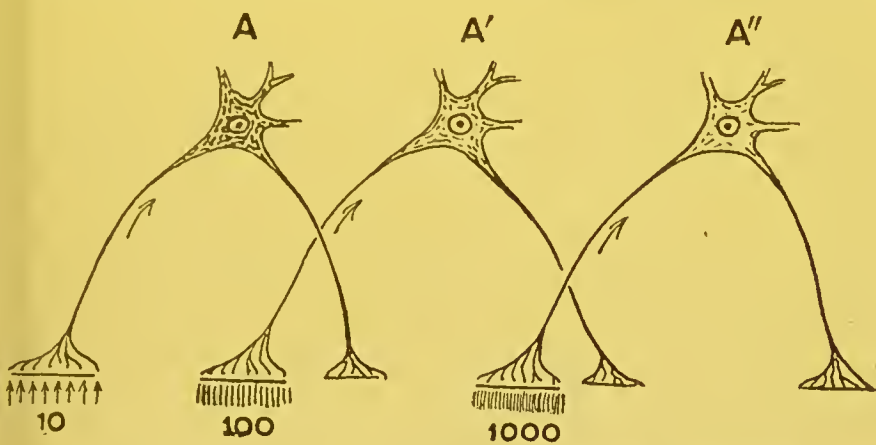
The apparent conflict between this physiological law and the physical law of Newton admits of ready explanation: the incident force is by hypothesis the same each time, but the cell upon which it acts is a different cell after each incidence, the force having wrought a definite change at each act. It follows from this that each act of incidence will evoke a different, and, as we have seen, a diminished reaction.

We pass now to the consideration of the process

of organisation as it stands related to consciousness. It is in the central cell, as the stimulus passes through it, that consciousness arises; now, though we are entirely ignorant of the *modus oriundi* of consciousness, yet we learn that in some way it depends upon the resistance which the stimulus meets with as it works its way into and through the cell. How do we know this? Because we observe that it is first efforts which most vividly affect our cognition, and that as the stimulus which excites an act is repeated again and again, so sentience is less and less stirred. But we have seen that as the act is repeated, so the resistance, opposed by the cell to the stimulus, is lowered; accordingly, *pari passu* with the fall in resistance, consciousness tends to fall in its intensity. So important is this fact that it may be worth while to represent it diagrammatically.

In this diagram it will be seen that the lowest stage of organisation, A, is the stage in which sentience is most marked; that the middle stage, A', corresponds in organisation to a reduction in sentience which we may label *subconscious*; that the third stage, A'', corresponds to so faint a stirring of sentience that we may disregard it. This stage we may speak of as the *unconscious* stage. In A the stimulus, making its way through an untravelled protoplasm, occasions the greatest amount of molecular disturbance, which we may describe as internal friction; in A' the repeated passage of the stimulus has established lines of diminished resistance, and exactly to this extent

the internal friction will have been reduced; in A'' lines of *least* resistance have now been formed, organisation is complete, and internal friction reduced to a minimum. The degree to which consciousness is stirred is directly proportional to the internal friction excited by the passage of a stimulus, and so from the more or less vivid sentience indicated by A we have fallen to a



A, A', A'' stand for the same cortical cell in process of organisation.

A has received a frequency of stimulation represented by 10; A' has received a frequency of stimulation represented by 100; A'' has received a frequency of stimulation represented by 1,000.

The stimuli are assumed to be of the same value *qualitatively* and *quantitatively*.

The depth of the shading of the cell is intended to show the intensity of consciousness aroused.

minimal sentience, which is negligible, in A''. If a piece of iron were possessed of perception, in however dim a form, we might imagine this perception to pass through the stages A, A', A'', as it came first under the influence of the magnet, and, by frequent renewal of this influence, passed gradually into a state of full magnetic polarisation (complete organisation). The term *automatic* is

applied to the act which is effected by the stimulus in A" (after organisation has been completed), because the act is effected unconsciously. It is quite true that organisation is never really completed, and that the continued passage of stimuli must continue to break down resistance, but it is convenient arbitrarily to speak of organisation as complete when stage A" has been reached.

On these lines organisation of the nervous system takes place upon a very extensive scale, the activities first of one group of cells, then of another group, entering the field of cognition more or less vividly, then less and less vividly, until by degrees they fade and finally disappear below the subjective horizon. Numberless functions are thus incorporated and delegated to sentient obscurity, but though unrecognised subjectively, the performance of each such function gives proof that *stimuli are still arriving and departing and taking full effect*. The law of organisation is one which is in no sense selective; every function is subject to it, the simplest and the most complex alike. The simpler the function the more readily is it incorporated; this we should expect; but how inevitably the function, even the most complex, succumbs to the automatic development, the performance of the accomplished musician gives evidence. In the diagrammatic representation of the process of organisation we have assumed *constancy* of the stimulus in quality and quantity, but if now we allow the stimulus to vary in intensity (*i.e.*, quantitatively) we find that every increase in

intensity tends to bring back into the field of consciousness the function which has become automatic, *i.e.*, unconscious. This also we should expect. Each level of stimulus intensity will have its own rate of organisation, but as we pass from one level to another, from lower to upper, there will be the above-mentioned tendency for consciousness to re-emerge. In health the stimulus which by repetition has disappeared subjectively will on increase of its intensity tend to reappear as *pain*. This will perhaps stand as the rule, and this rule probably holds also for disease. In this way we shall seek to explain how it is that the patch of pleura, which on each expansion of the lung has rubbed smoothly and without our cognisance against its *vis-à-vis* patch, may become the seat of an exquisite pain upon the exchange of health for disease. Very possibly in this instance the patch of pleurisy may be the seat of qualitative as well as quantitative changes in the value of the stimuli, but this, whilst qualifying, will scarcely invalidate the foregoing.

We pass now to a question of much interest ; it is this : Consciousness having been abolished in respect of a given function, can it be revived without varying the peripheral stimulation ? The answer is, undoubtedly it can. The process of organisation as represented on p. 97 assumed a peripheral constancy in the stimulation, and, we might add, in the excitability of the peripheral structures, but no reference was made to the state of the central cell. Yet constancy of excitability was implied here

also—that is to say, at each stage of organisation, A', A''.

But suppose the excitability of the central cell at any given stage cease to be a constant, what then? To answer this question let us revert to the diagram, p. 97, and consider cell A'', which, fully organised in respect of a given function, is traversed by paths of least resistance for the stimuli belonging to that function. Now the reason of the unconsciousness which here obtains lies in this very path of least resistance which the frequent passage of stimuli has worn smooth. Along this pathway the stimuli flow with such ease, with so little friction, that consciousness is not awakened. Nature furnishes us with familiar examples of a similar process taking place in the physical world:—thus the flood which breaks from its confinement and makes a bed for its escaping waters creates a violent reaction in the soil through which it forces its way, but subsequent floods taking the same course meet with a continually diminishing resistance along the line of flow, though along any other fresh line they would meet with an opposition as vigorous as that first exhibited; clear proof that no reduction in the excitability of the soil outside the line of the current has taken place. Suppose, now, that it were possible to change the nature of the bed of the stream from rock, say, to loose gravel; forthwith the reaction of the bed to the stream would change, and we should see those waters, which until then had been observed slipping over the smooth, hard surface with very little reaction, now burying themselves with

much turmoil in the soft earth. In like manner, if we imagine the excitability of the central cell to be suddenly greatly augmented, the excitability of the path of least resistance will rise proportionately, and a reaction will ensue which will raise the effect of the stimulus from minimal to maximal; with this change consciousness will again become vivid.

Regarded thus, we shall picture the nervous system to ourselves as a congeries of centres, higher, middle and lower; centres dominant, centres coordinate, centres subordinate; these all presiding over the functions of the body, as a whole and in every part. We shall note that under ordinary conditions many of these centres do their work without troubling consciousness the least in the world; the action of the stimuli which evoke the function not being reported at headquarters. We shall, however, regard this question of conscious or unconscious action as relative, and subject to constancy in the peripheral excitation, and constancy also in the central excitability; and we shall be prepared to see consciousness revive upon any augmentation of the one or of the other.

What proof can we adduce that this picture is drawn to the life? The evidence is twofold: it is of health and of disease; for the moment, that which shall concern us shall have reference solely to the central inconstancy; we will leave out of account the question of peripheral variability, though that, too, must obtain. In health, then, let us seek in the effect of the emotions the proof that the perceptivity of our nerve centres varies, and varies

markedly. Fear furnishes a good example of the kind, for with the mind on the stretch of apprehension we all know how consciousness exaggerates that which the senses report. Stimuli of the mildest degree enter now and are received with alarums and excursions; the eye sees, the ear hears with an acuteness which is painful, and this seeing and hearing are not of the peripheral organ of vision and audition, but of the presiding nerve centres. In like manner, though less strikingly, the mind in pleasurable anticipation, on the tip-toe of expectation, is intent, literally on the stretch, to receive and respond to the minimal excitation. These examples may suffice for the evidence which health affords, and we pass to that which disease supplies in superabundance. Familiar enough to the physician in consulting-room and hospital practice, of common occurrence in the life of the household, is the symptom for which no sufficient external evidence can be produced. Here is a pain located by the sufferer with precision in this or that part—now in a joint, now in some deeper part of the chest or abdomen; it may be slight or severe, but, more or less, it holds the attention. Or it is a “strange working,” hard to describe, or a sense of creeping, tingling, burning, fluttering which is present; the vocabulary is hard set to express the variety of feelings which make their complaint. We investigate with the utmost care, and we find nothing adequate to account for the symptom. The part looks healthy, there is no change of colour, no undue redness or swelling, no increased heat; the

functions of the body are uninfluenced. Sometimes minor changes are present, but they are wholly inadequate, and the judgment decides that such as they are, they are secondary and not primary. There, however, the symptom is, and it may serve to wreck a life as effectually, nay, more effectually, than a corporeal disaster of the first magnitude. So much does it weigh upon the mind, this symptom, that the patient is often willing, nay, eager, to substantiate its existence at any cost, even though it be to part with a limb or to undergo some major operation. Strange to say, the patient, whilst ready to make so severe a sacrifice as this in proof of good faith, may be really unwilling to part with the symptom itself; that will have become, by such time, a nursling which, if we are not called upon to admire, yet at our peril we shall disregard. Thus it comes about that, persuaded, against our better judgment, of the reality of the mischief, we yield to the patient's importunity—the limb is lopped off and we find a perfectly healthy joint; the dreaded operation on the abdomen is performed, and to our humiliation the parts exposed reveal the polish of health; discomfited, we withdraw, leaving the symptom in full possession.

Where can the incubus house? Baffled in our search, we are often tempted to deny its very existence, and, consigning to the wastepaper basket all those careful descriptive records laboriously collected, to bid the patient and the household ignore the demon. At times this evasion of the difficulty may actually prove successful, but only

too often it fails: the obsession persists and grows. Is it real or not, this nebulosity? To that question there is but one answer—it is very real, and the evidence of its existence rests upon a foundation as secure as that of the famous *cogito, ergo sum*, for if this is proof of being, then how can we deny existence to this subjectivity?—*sentitur, ergo est*. Whatever its nature, *It is, because it is felt*: these symptoms, pushed home, bring us to sensation as to an unquestionable finality; the eye and the ear bring us this and no more; we are what we are sensorially, and the last word rests with Bishop Berkeley.

Accordingly, the symptom exists, and we return, therefore, to the question Where? Well, centrally; there is no other place for it if it be not at the periphery. But those centres which are now crying out have long become unconscious to stimuli arriving from a healthy periphery, and peripheral health is here. True; but this held only so long as there was central health also—grant a morbid condition at the centre and normal stimuli will rise into sentience, and this sentience be perverted to the exact measure of the central perversion. It may seem that the proof of this is not forthcoming, since we have in general no opportunity for examining these centres, such as we have in the case of the periphery; and in those instances in which death from other causes has given the opportunity, the naked eye may have seen nothing, nor the microscope. This last evidence, however, is not convincing, for neither the naked eye nor the microscope

will show any difference structurally between the piece of magnetised iron and that which is unmagnetised, though molecular change there is. We cannot therefore be surprised if the polarised nerve-cell is equally reticent concerning its polarisation. It will be said that if the naked eye and microscope are not able to pronounce as to the state of the nerve-centre, neither can they do so in respect of the peripheral structures, and that disease may be here though we see it not. This is quite true ; but the argument here pursued seeks to make room for the pathology of an elusive symptom by opening up the central nervous system in its length and breadth as a field of operation, rather than to pit against each other the rival claims of centre and periphery. There are, however, reasons for thinking that the centre, as the more delicate or nobler structure, is more likely to suffer disturbance than the periphery, besides other evidence to which we shall have to call attention later.

There remains at this stage one other point which must be considered. We are assuming that changes in the nerve-centre will in many cases be responsible for the subjective symptoms complained of ; if so, how comes it that the periphery is so often credited with the mischief ? Why is the pain or the perverted sensation referred to a joint, or a skin area, or some other structure superficial or deep-seated ? The explanation is quite simple : here is a centre presiding over certain peripheral functions, which functions are normally performed unconsciously ; if, now, the altered state of the

nerve-centre be such that stimuli previously inadequate to excite consciousness become consciously effective stimuli, then the mind will be referred to the area of operation of these stimuli as the seat of trouble, although the stimuli in question are not abnormal either in quality or quantity. The place reference will, in fact, be exactly the same as it was at the beginning of the process of organisation, when the function was still a conscious performance. The first finger-exercises on the piano are conscious, and consciousness is projected into the fingers in their unwonted placings and movements; the last finger-exercises are entirely automatic; now disease steps in, and by raising the excitability of the presiding nerve-centres makes these sentiently responsive to the stimuli of which they had become oblivious: the projection of consciousness is still into the fingers. Thus it is that misreadings of a normal stimulation may lead us to amputate the limb when we should rather excise the peccant centre, or to apply to the surface the local sedative which the centre is calling for.

Such is the body, such, actually and potentially, the nervous system to which in sickness we present the medicaments to act as remedies. Applied to this body the medicaments as forces will suffer the same fate as other forces—the law of organisation will hold for them, and, to the extent that their entry is accompanied by consciousness, this consciousness will tend to fade with repetition of the medication. To revive the sensation the dose of the drug will have to be augmented, and the first

steps towards the Drug Habit will be taken ; but we need not pursue this—it is sufficient at this stage that we note the behaviour of the body towards force generally, and recognise that the medicaments are for the most part force-bearers.

IDEATION IN ITS RELATION TO TREATMENT: THE "IMPERATIVE SUGGESTION"

IT was the belief of S. Francis of Assisi that "whosoever would attain to a life of perfection must cleanse his conscience daily with an abundance of tears": acting upon this, it is related that the Saint developed in consequence an affection of the eyes which seriously threatened his sight. His physicians remonstrated, urging him to restrain his weeping lest this evil come to pass, but they met with a characteristic response: "It is not fitting, Brother Medico, that, for the love of that light which we have here below in common with the flies, we should shut out the least ray of the eternal light which visits us from above; for the soul has not received the light for the sake of the body, but the body for the sake of the soul. I would therefore choose rather to lose the sight of the body than to repress those tears by which the interior eyes are purified, that so they may see God." And thus he would not yield to their importunity, but, on the other hand, he was willing that Brother Medico should do what he could for him in

other ways. The actual cautery was advised, and, though shuddering with dread, S. Francis submitted, first appealing to and exhorting Brother Fire to be merciful and "courteous." The hot iron was drawn from ear to brow, but he did not even flinch, and when questioned concerning the pain made answer: "Praise," said he to the brethren, "praise ye the Most High, for I truly tell you that I neither felt the fire's heat, nor pain of body."¹ His spirit, fixed in contemplation and adoration of the works of God, had exclusive possession of consciousness, to the disregard of the appeal of the hot iron to the senses.

That this relation is no mere story but a record of fact is abundantly testified to by history in the Acts of the Martyrs, and indeed all along the line, even down to present everyday life both in health and disease; it merits, therefore, our careful attention. What are the facts? A physical agency, fire, is applied to the tissues of the body; its action, transmuted variously, but according to a rate of exchange fixed and conceivably calculable, will spend itself in the part as so much energy: it is, in fact, a dose of energy, measurable in the first instance as so many heat units. In the tissues acted upon are nerves, sensory and motor, which, confining our attention to the former, will carry centripetally so much of stimulation, again conceivably calculable. The stimuli will be conveyed to certain nerve

¹ "Life of S. Francis of Assisi," by Mrs. Oliphant, pp. 273, 274. See also "Vic de S. François," par Paul Sabatier, p. 358.

centres, and ultimately will reach, by pathways well ascertained, those highest centres in which consciousness arises ; here, in the ordinary course of things, they will be translated into pain, to be borne with more or less fortitude and control, but in any case to be suffered. How comes it that in the case of S. Francis, related above, this final event fails to make its appearance ; for the point of the relation lies not in any control over pain, but in its complete absence.

Now, so far as the physical substratum of pain is concerned, it cannot be assumed that this has ceased to be ; the doctrine of the indestructibility of force makes that an impossibility. Accordingly, whatever vibration or molecular movement is brought by the sensory nerves to the sensory centre, that vibration or movement or its physical equivalent must be excited in the centre. There will therefore be no break on the physical side, and the strange thing comes in only when we pass to the psychical aspect of the problem, and note that at one moment a given molecular disturbance is accompanied by vivid sensation, whilst at another time there is no sensory record at all. The problem is wholly different from that which we were considering when discussing the effect of repetition in organising a centre : in that case it was not a *given molecular disturbance*, for with each act of repetition the molecular (frictional) disturbance grew less and less, whereas here sentience is at one moment in vivid attendance, at another moment it has completely disappeared, though the physical announcement has

not varied. Upon what principle this game at bo-peep may be conducted between the psychical subjectivity and the physical objectivity, is a matter calling urgently for elucidation, for here is a centre which now sees and now is blind, which now hears and now is deaf, now feels and now is numb : how comes this to be ?

Whether this question will ever be capable of a satisfactory answer is difficult to say. Probably it will not, seeing that we are dealing with a fundamental mystery, the genesis of consciousness, and that between this and the physical a hiatus exists which may not be bridged ; but, inasmuch as we do recognise certain conditions or states which seem to regulate or affect the appearances and disappearances of sentience, it is necessary that we should acquaint ourselves with these as far as is possible. There is a power of the mind known as attention, which from the gross sum of perceptions arriving *viâ* the senses selects this or that for consciousness to dwell upon and, as it were, devote itself to. It may be a visual image, with the ideas which cluster around it ; it may be an auditory impression with its cluster ; it may be some mental concept which we are not able to trace to or connect with any particular organ of sense ; but, whatever it is, attention having selected it, upon that consciousness is concentrated.

In considering this matter of the direction of consciousness it would almost appear as though a certain amount of percipience, and no more, were available at any one moment. We are witness, for

instance, of this state of things—the mind on the alert, every sense on the watch, the whole organism sensitive to the least impression, no matter where it fall—such is the man expectant, intent, awaiting the call. Sentience in this state of expectation seems almost to overflow its borders, permeating every part of the body to the very finger-tips, but it is potential sentience, it has not yet been roused, and mentality is really in abeyance for want of an objective ; indeed, the state is passive rather than active. The emotion fear may bring about such a state of things, which is well conveyed by the word “apprehension.” Now comes the call *viâ* this or that sense organ, or perhaps there come in quick succession many calls ; the mind receives, perceives, and judges this or that as worthiest of note ; forthwith the attention directs the mind upon this objective, and in proportion as consciousness is roused and focussed upon the objective with greater or less intensity, so the mind withdraws, from all those parts of the body not immediately engaged in the contemplative act, the potential sentience which formerly was theirs : such is the man reflectant, absorbed, introspective. Archimedes engrossed in the mystery of the intersecting lines which he had traced in the sand, what did he hear or see of the fall of Syracuse ? It is a matter of speculation almost whether he felt the Roman sword which gave him his death, so untenanted, so void of sentience, were the outworks of his body. The faculty of attention, *i.e.*, of directing and fixing the mind upon an objective, varies enormously in its

development in individuals ; but so long as the direction lasts—within certain limits, for attention is subject to a law of fatigue—sentience within the area of activity is intensified. Thus, consciousness under the dominance of this power gathers itself together and condenses in this brain area, withdraws itself from and becomes attenuated in the surrounding brain areas, almost as if it were a material essence in limited quantity.

This power of concentration and of dispersion does not apply only to consciousness in active operation ; it applies also to consciousness in its potential or expectant state. The attention can prepare a brain area to receive, can forewarn it to make ready ; this is described in common parlance by such expressions as to become all eyes, all ears. The functions of the brain area thus prepared are intensified, and as compared with an average state such brain area may be regarded as hypersensitised. But one brain area standing at attention means other brain areas standing at ease, less ready, relatively unreceptive.

Accordingly, it is ours by an act of will to direct the mind so that, either in active operation or in a state of anticipation, consciousness musters in one or more brain areas, evacuating at the same time, like an army of occupation, adjacent brain territories. It is ours so to do, but this act may also be the work of an outsider whose will it is to engage and disengage, to bind and to loose, these or those of our mental powers which he selects. Thus at will the operator will play upon our nervous system, as

the piper on his pipe, for, provided he have the art, it is all a matter of ventages and of stops, properly governed, as Hamlet was careful to explain to Guildenstern. Acting upon this principle, the conjurer conjures away our wits by engaging the mind in one direction whilst the essentials of his juggling take place elsewhere. He makes us all eyes when we should be all ears, and *vice versâ*, and so we are deaf through too much seeing and blind through too much hearing and—"Presto! Pass!"—the wonder is before us.

Without doubt, the remarkable phenomena included under the headings of mesmerism, animal magnetism, Braidism and hypnotism stand closely related to this department of psychology: they may arise, self-induced,¹ but more commonly they demand an operator. In the hypnotic state we see mentality restricted in its operations to some one part of the brain, which brain area shows itself remarkably impressionable—so impressionable that it takes upon trust, on hearsay, that which the mind of the operator presents for acceptance, to the neglect of that which the senses report. This follows, since the sense organs in immediate relation to the impressionable area must arrange the stimuli which they receive according to the careful law of their organisation, for we cannot question that the structures of the eye will refract and focus the rays of light in the usual way; whilst certain it is that that

¹ Hack Tuke's "Dictionary of Psychological Medicine," art. "Hypnotism in the Hysterical," by Charcot and Gilles de la Tourette, vol. i, p. 609.

which reaches the visual centres *viâ* the optic nerves gives rise to an image wholly different from the image which would have arisen in the normal state, and thus the hypnotised person becomes the subject of an illusion, which forthwith becomes a delusion of the mind. In other cases, in the same state, the report of the senses is not simply misread, but is entirely overlooked ; in such cases, however, we shall be dealing with those brain areas from which sentience has been withdrawn more or less completely, owing to the preoccupation which engrosses the impressionable area : we may then witness an anæsthesia so profound that the most painful operation, the extraction of a tooth or the amputation even of a limb, is possible without the manifestation of any pain on the part of the patient.

With such evidence of a disturbed cerebral balance, this centre unduly sensitive, that centre benumbed, we shall not be surprised to find that those higher powers, judgment, discrimination, which imply a nice balance, are conspicuous by their absence. We shall likewise note a marked absence of will power, to such an extent, indeed, that, within certain limits, the hypnotic subject must be regarded rather as an automaton than as a man, so obsequious is his subordination to the will power of the operator. All initiative seems to come from the latter : he it is who suggests, he who makes believe, he who incites to action.

Nor is it only in the higher spheres of cerebral action that the hypnotic state declares its perturbation—nerve stimuli being either strangely

reported by the nerve tracts or their report strangely misread, probably the latter—the muscles also seeming to show a new physiology ; thus the muscular contraction appears to follow a new law of fatigue, judging by the prolongation of muscular effort, and in respect of intensity of action the same is true, the rigidity of the muscle fibre being so intense that it “ would be torn sooner than unbend.”¹

In how far nutritional, *i.e.*, chemical and physico-chemical, processes follow suit by a perverted action it is difficult to say, but if we may judge by the metabolic eccentricities observed in the hysterical state, itself closely allied to the hypnotic,² the probability is that they also are modified.

Now, what is it that is capable of converting a living, sentient, thinking and purposing man into this travesty of humanity, this puppet, this marionette ? The fixing of the eyes and mind upon some bright object, so as to induce visual fatigue (method of Braid) ; light pressure on the eyeballs with the fingers (method of Lasègue) ; a sudden bright light, a sudden sound, in the case of those who are sensitive to hypnosis ; or a few passes and a few words addressed directly to the subject of the experiment : in some cases not even these simple procedures are needed, the hypnotic state arising self-induced.

Running parallel with the facts of hypnotism are

¹ Hack Tuke's " Dictionary of Psychological Medicine," *loc. cit.*, p. 608.

² Charcot and Gilles de la Tourette, *op. cit.*, *vide supra*.

those of the hysterical or neurotic state, a condition not confined to one sex, though more prominent in women. Charcot and de la Tourette insist upon the many points in common which exist between hypnotism and hysteria, but whereas the one is for the most part factitious, *i.e.*, an artificial product, the other arises daily in our midst, and meets us at every turn in the highways and byways of life. It will not be necessary to enter into a detailed description of hysteria; it shows us the same deranged mental balance; the same preoccupation of certain nerve centres; the same vacuity of other centres; the same loss of judgment (when the fit is on), together with perverted or enfeebled will powers; the oddest combinations of hyperæsthesia, anæsthesia and paræsthesia (combinations which disdain the limitations of nerve distribution); further nutritional aberrations,¹ and other vagaries: in brief, it shows us pathology in motley, aping every form of disease.

To draw the line between the excitable or highly strung nervous system and the milder forms of the neurotic type is not feasible, and from these we pass in like manner by insensible degrees into the more and most pronounced forms of the *petite* and *grande hystérie*—thus from the sober hues of health to the garish colours of disease.

The same is true of those forms of nervous disorder which we class as mental derangement—insanity; for whilst it is necessary on practical

¹ Witness the changes in the composition of the renal secretion occasioned by the hysterical attack. Charcot and Gilles de la Tourette, *loc. cit.*, p. 610.

grounds to separate the mentally deranged, as a group, from the neurotic, as a group, yet when we come to the individual case the determination may be on occasion impossible, and the terminology a matter of option.

But mental disease offers to view the most startling instances of perverted neuro-muscular and other activities in association with the psychic disorder, and again we have before us the strange relation which obtains between the ideational and the physical. In this wise, hypnotism, hysteria, insanity, each and all, proclaim the fact of the dependence of body on mind and the mystery of the dependence.

The converse, viz., the dependence of mind upon body, is so completely established and so fully recognised that we may pass it over, and accept therefore as proven the *interdependence* of mind and body.

We have said that between health and sickness the gradation is by imperceptible steps, and accordingly we shall be prepared to find that here also in these relationships the phenomena of disease are separated from those of health by gradation only. This is so: attention is of health if controlled, of disease if uncontrolled, but in either state it is the same thing, and it delivers the same argument, the reciprocal relations of mind and body. "Read o'er this; and after, this: and then to breakfast with what appetite you have," said King Henry, dismissing Cardinal Wolsey, therewith giving his kingly recognition to the power of the ideal over the

material, even in a personality so great and sane as that of Wolsey. That, however, was a general proposition, but if we wish for an example of the power of suggestion grafted upon attention, let us go to the speech of Mark Antony over the body of Cæsar :

“Look ! in this place ran Cassius’ dagger through :
See what a rent the envious Casca made”

—what need have we to go to hypnotism *in camera* when here in the open forum, in broad daylight, and amid the commonplaces of everyday life, it declares itself? Spell-bound at the sight, their attention riveted, this unimaginative coarse rabble were goaded to madness by the words of Antony, saw as he would have them see, thought as he willed, and wrought havoc as he had determined they should. The art of suggestion is but too well known to the advocate and the orator, and used because of its power, but for the most part we fail to realise how suggestion works in detail as well as in gross throughout the business of life ; and this brings us to the point of these considerations, viz., that in the healing art no less than elsewhere the ideational is a living force.

Now power is for use and abuse, and suggestion is there for the patriot orator to use and the demagogue to abuse, for the advocate of truth to employ and the special pleader to misemploy ; in like manner it is there for the physician to honour and the charlatan to dishonour. It is necessary that we should clearly face this question,

and recognise that in matters medical, as elsewhere in life, there is a right and a wrong use of suggestion ; how indeed should it be otherwise, seeing that it is a power which rests upon the conformation of man as he has been fashioned by the Creator? This must be the excuse for this chapter, the aim of which has been to draw attention to the ideational and its place in medicine.

The healing art, though as old as the hills, or at any rate as old as man, bases its claims to be regarded as a science upon foundations which are of yesterday only. Until chemistry had made its first serious beginnings towards the end of the eighteenth century no such claim was possible, though since remote times, in many and diverse theories, mankind had put forth tentative feelers in search of the firmer groundworks of knowledge. With those first beginnings of chemistry, in which measurements and weighings formed so conspicuous a feature of the exploration, it was natural that material conceptions should prevail ; this actually came to pass, and thence onwards for the scientist in general the immaterial was—well, very immaterial. Medicine could not escape this tendency, and accordingly the physician followed hard upon the physicist and the chemist in the endeavour to materialise the phenomena which presented themselves to his ken, from the glancing thought to the “burden of a sigh,” and thus the “animula vagula” came into the scale pan. Reaction followed, as was inevitable : the animula was indignantly snatched from the scales and the balance toppled over as a

useless concern where the more vital, spiritual interests of man were concerned. "Christian Science," "Mind Cure," "Faith Cure," "Metaphysical Healing,"¹ appeared upon the scene, and it is there precisely that we now find ourselves.

Where is the truth to be found between these conflicting views? Clearly not with the materialist if he attempt to ignore the true "imponderabilia" which the psychic manifestations show forth, and as clearly not with the spiritualist if he essay to make light of the "ponderabilia" which are there past dispute. The problem, and it is a hard one, is to render unto the Cæsar of Matter the things that are Cæsar's and unto the God of the Spirit the things that are God's—nay, the task is harder still, for the Cæsar of matter is the Creator Himself, and He claims as tribute-money recognition of and reverence for the material.

Suggestion, then, must be made room for, the dominance, or *predominance*, of the mind must be conceded, and those ailments which have come in by the way of the psyche must be exorcised by the psyche, and those bodily ailments which possess a psychic element must in their successful treatment include the psychic element. Tenuous as is the spirit, it keeps company with the material by bonds invisible, and so we find that to the material elements of the *medicamenta* proper, those things which we handle and weigh and compound, it is

¹ See article in *Spectator*, February 16, 1907, "On the Power of Suggestion."

possible to attach and associate the subtile but potent suggestion.

It would be beyond the scope of these pages, which profess to deal with drugs and drug treatment, to attempt to determine the sphere of usefulness of hypnotism and hypnotic suggestion, and it must suffice if, in connection with "Christian Science," and "Faith Cure," and "Metaphysical Healing," we record simply our conviction that these embody a fundamental truth, namely, the influence of the mind and of the emotions upon the body, and that a large class of states which we recognise as morbid depend essentially upon this relation, and call for a treatment which acknowledges this dependence and is based upon it. It is otherwise, however, in respect of the fact that the drug itself conveys not merely the virtues inherent in its substance, and of which the chemist and the physicist claim to render account, but that it also brings a psychic energy which derives from the personality of the prescriber; this we may not pass by.

It is said, and probably with much truth for a certain class of patients, that it is disturbing to see the physician hesitate over his prescription, and that for him to permit any inkling that there is debate in his mind upon the case before him is an offence, which becomes heinous if in the presence of the patient he venture to consult the pages of a book. The explanation of this unreasonable attitude of mind is very simple: it is that the patient comes to the physician for reassurance, and

that any action, however trifling-seeming, which indicates hesitation, raises a doubt in the patient's mind as to that fulness of knowledge and power over disease upon which his confidence rests. Certain it is, that from the financial point of view the most successful practitioner is not always he who knows most, but he who, however profound his ignorance, has or exhibits no doubts. Such an one sends away his patients brim full of assurance, though his prescription may be as empty of intrinsic virtue as a shelled peapod. Here is his formula—

R “ of futility A so much.

„ „ B as much.

„ „ C sufficient to make a draught.

Mix well and let the patient take according to directions.”

In contradistinction to this prescription, there is another formula cast in the same time-honoured mould and constructed with all care, so as to contain virtues co-operating to one end, but less impressively delivered: this last may fail where the first succeeds. The fact is that prescription No. 1, or futility to the third power, issues from the dispensary surrounded by a nimbus of assurance, and each dose recalls more or less vividly the confidence instilled into the patient at the visit, and so each dose readministers consolation and encouragement. On the other hand, prescription No. 2 lacks this very thing, encouragement, and so the suggestion of health which the other brings is not conveyed. But in a

very large class of disorders the main element is psychic, and in such it is clear that the first prescription will prove the more effective one.

Into the ethics of the employment of suggestion this is not the place to enter—it is a power and it should be used; it is a power and it may be abused: it is there for the honest physician, and it is there also for the charlatan. Let the former act up to his own best sense of what is right, having regard for the interests of all concerned, and he will not go far wrong: certain it is, from the scientific point of view, that if we employ suggestion, and, more or less, we cannot avoid so doing, we shall do this with most efficacy if we associate the suggestion of potency with the dynamics of a formula which experience has proved to be effective quite apart from psychic influences.

Administered thus, the sedative will prove more soothing, the soporific more sleep-giving, the tonic more invigorating; for the mind expectant of benefits will predispose the organism to receive and to respond to these material activities. The physical wave will thus be reinforced by the psychic wave, and the organism in its psycho-physical duality will move obediently to the dual impulse.

The moral obligation which rests upon the physician may be condensed within the compass of a few words: it is for him to see that he do not abuse the confidence of his patient. On the other hand, there is a moral obligation which rests upon the patient, based upon the recognition that

there is a part which he himself must play, and that beyond a certain point he may not shift his responsibility on to the shoulders of any third person, medical or other. The refusal to bear the least pain, the insensate flight from disease in all its forms, and the seeking to escape at all costs—this is not what was intended; this represents a form of moral insanity, to meet which any science which shall prove efficient will be a Christian Science indeed.

The “imperative suggestion” works in one of two ways—either by inhibition or by excitation; that is to say, it either lowers or raises the plane of tissue activity. The nerve impulses with which the physiologist deals act in like manner, either reducing or heightening cell activity, and special nerve tracts are in some cases laid down for the carrying of these depressor and accelerator impulses respectively—the nerve supply to the heart is an instance in point. What the precise nature of these physiological acts may be, what the *modus operandi*, we do not know; all that we do know is that force of some kind has been conveyed, because in the cells acted upon there has been either a cancelling of activity or an augmentation—cell momentum has been taken from or added to. In like manner the influence of the psyche, however conveyed, however applied, must be of the nature of a force, because cell momentum has been destroyed or multiplied. Is there a third possible mode of action? Without doubt, for in certain cases it would seem as if the

physiological influence conveyed by a nerve fibre, without manifesting itself actually as a plus or minus dynamisation of the cell, has raised or lowered that state of the cell which we call its "tonus," and which we may translate as tension or polarity. Accepting this third method of working, we must still regard the influence which has effected this change of tone as of the nature of a *force conveyed*, the only difference being that the quantum of energy which has come along the nerve has become stored within the cell as *potential* energy instead of becoming *dynamic*; for what is the tension of the bow or the polarity of the magnet but stored energy? The psyche must surely act in like manner, raising or lowering tissue potential, the same explanation being applicable to this act, viz., a conveyance of force.

After this fashion the Psyche will move in and out of the planes of physical activity, and such of the medicamenta as it may find there at work will experience its co-operation or its antagonism.

PAIN—ITS THERAPEUTICS

WE are told by the logician that as a word gains in intension so it loses in extension, and we accept the dictum as the statement of a fundamental law of thought. From this as a starting-point we set out hopefully in the expectation that the word "pain" may be found to be of limited extent, since, unquestionably, it is of deep intent. Unfortunately, this is not so, for the law above mentioned has no application to words in their initial meaning—they begin with various connotation and denotation, and it is only after they have started their career that we discover that thence onwards any qualifying addition narrows the applicability of the term. Pain, to our distress, though questionably to our ill-hap, starts with a profound significance and a wide embrace. It carries with it the sense of penalty, which at times, alas! seems to have fallen upon the innocent, the real delinquent failing to put in an appearance on the plea of an *alibi*; it carries with it the sense of bodily suffering, of distress of mind, of toilsome effort, and with so much meaning it casts a capacious net and secures a great draught.

But what has this to do with drugs and drug treatment? This much : that pain is responsible for many drugs. Look at the list—the opiates and their derivatives, the sedatives, the anæsthetics, the analgesics, the hypnotics. Modern chemistry is busy in their production ; by the shoal they make their appearance, presenting the old with the new in long succession : the morphias, codeias, heroins ; Indian hemp ; the bromides in great variety ; chloroform, ether, and their many congeners ; the cocaines ; the phenacetins, exalgins ; chloral, sulphonal, trional, veronal—and the half has not been told. So impressed is one, indeed, with the sedatives in manifold guise, that one is tempted to ask what manner of world this can be which requires so much soothing.

What, then, is pain, and why this call for separate consideration? Objectively we recognise or assume a physical disturbance, vibration—call it what we will ; this, occurring within certain areas of the nervous system, is followed by a troubling of consciousness which stands as the psychical counterpart of the physical perturbation. It is the fact that consciousness is troubled, not pleasurably stirred, which makes the difference between that which is pain and that which is pleasure. Pain is a consequent or symptom of an antecedent which, in many cases, we have no difficulty in discovering, but in very many other instances we are wholly unable to do this, the physical determinant eluding us pertinaciously—pain the symptom, pain the disease, alone

appearing. It is for this reason, and also because of the dominant place which pain occupies in the concern of the patient, even in those cases in which the physical antecedent is most manifest, that separate attention is claimed and conceded. For, take from ill-health the pain which it occasions, and its chief terror is gone. Ill health, it is true, is a *disorder*, as likewise it is a *disability*; but we are not such lovers of order that we would not forgive a little confusion, nor so greedy of work that we would not put up with some disablement, were it not for the distress, the discomfort, which attends; it is because of this that we have named it *disease*, this is why it has become for us a *complaint*.

Pain is of body and pain is of mind; it is not possible to compare them qualitatively, but we know that the *angor animi* may be as real as any bodily anguish and its distress not less. In a disease known as *angina pectoris* both forms are present, and it is difficult to know how to award the palm here—whether to the physical torture or to the accompanying fear of death. The terms grief, worry, anxiety, name other modes of psychic distress which call as urgently for help as any form of corporal pain. Pain thus depicted might be regarded as a distress, which, however hard to bear, is of the nature of a psychical *aside*; whether this conception of its nature would lead to its tolerance with more fortitude is doubtful, but it is certain that pain is something much more, something which touches the body far more closely than such a view would suggest. For, in fact,

pain can force an entrance into the most inner of the physical workings of the body and there take action, and this possibility constitutes another claim upon our regard. Thus, pain, if intense, may notably depress the heart's action even to a temporary arrest, the patient fainting outright; if very intense, this arrest may not be recovered from, and pain then will have killed. It is difficult to apportion the share which belongs to the conscious element in these effects, because it is certain that inhibitory influences attend the physical disturbance which is the cause of pain, though pain itself be eliminated; a severe cutting operation, for instance, will produce a circulatory depression greater or less, although consciousness have been completely abolished by chloroform or ether.

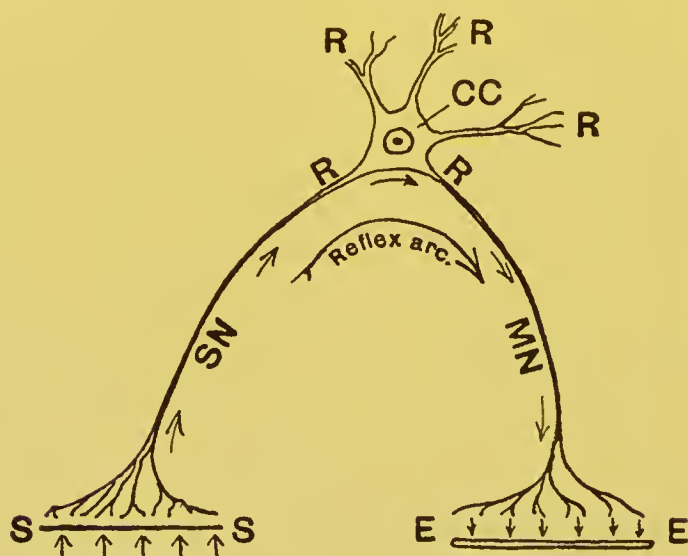
The term *shock* describes another form of circulatory depression which recent investigation seems to have referred almost, if not wholly, to the blood-vessels, as contrasted with *syncope*, or fainting, which is a cardiac effect. In shock the vessels are rendered toneless by an inhibition which falls upon the muscular fibres encircling the arterioles; the effect is a paralytic one, and pain may bring it about. Shock, though still witnessed after severe operations, even when conducted under complete anæsthesia, is no longer the serious condition which it was in the pre-anæsthetic days when pain was unbridled. These effects of shock and syncope are observed in full health of body; *à fortiori* they are witnessed when through any cause the vital powers are lowered; shock and syncope both bear

evidence that pain is not a mere *aside*, but is capable of interrupting with a rude hand the most vital of functions.

Pain is intimately associated with the emotions, these modifying and governing the state of the nervous system to a surprising degree. It is familiar knowledge how acute the senses become under the influence of fear, which, being interpreted, must signify either that the carrying paths, the nerve tracts with their terminal sentient expansions at the periphery, are tuned up to a higher pitch of receiving and conveying stimuli, or that the central perceptive parts of the nervous system to which the stimuli are brought are themselves heightened as to their irritability. The latter is the more likely because these same centres represent probably a higher, and therefore a more susceptible, organisation. Be this as it may, the fact of the dominance of the emotions over the organic functions is indisputable, and it probably accounts for those strange happenings which have been recorded, not on the event itself, but on the anticipation of the event. Cases of the kind are well authenticated; thus, in "Tillmann's Surgery" (vol. i, p. 28, 1900) we find the record of a sudden fatal syncope in a patient prepared for operation, upon whom the operator, in demonstration of the procedure which he proposed to adopt, had drawn a line, with the finger-nail, along the course of the intended incision. This was done before the administration of chloroform had been started. If so violent a reflex may result

from a sensation not even painful, in the ordinary way, it indicates the degree of potential hyper-æsthesia which apprehension may bring about, and the actual harm which a stimulus of greater intensity is capable of effecting.

Conceding the need for the treatment of pain, there are two distinct lines of approach along which



SS = Sentient surface.

SN = Sensory nerve.

CC = Cerebral cell.

R, R, R = Ramifications, ingoing and outgoing.

MN = Motor nerve.

EE = Efferent end-organ.

The small arrows indicate the course of the stimuli.

The larger arrow, including ingoing and outgoing stimuli, indicates the *reflex arc*.

the remedial influence may be brought to bear upon the nervous system, namely, by way of the periphery and by way of the centre. A diagram may assist in developing this.

Reduced to its simplest terms, the nervous system consists of a surface adapted for the reception of stimuli, S S ; fibres which gather up and convey these stimuli by the sensory nerve, S N ; a central cell, C C, which receives, modifies, and transmits the incoming stimuli ; branchings, R, R, R, which serve to establish the relations of the cell to other parts of the body—they are both ingoing and outgoing channels ; an efferent fibre, M N, here a motor nerve ; an efferent end-organ, E E, here a muscle fibre. The whole constitutes a reflex arc.

The disturbance, as it arises with the incidence of the stimuli at S S, travels as a molecular disturbance into and out of the cell, and finally reaches the irritable mechanism of the end-organ, E E, in which the afferent stimuli which began at S S emerge as a motor effect (contraction). *En route*, as the stimuli pass through the central cell, C C, consciousness arises after a manner which is absolutely inscrutable, and we do no more than record the fact of its genesis.

Now the two lines of approach of the remedial influence are (1) peripheral, (2) central. The numbing influence applied to the sentient, receptive surface or to the nerve fibre, collecting and conveying, represents the peripheral approach. This mode is the one to which recourse should be had in the first instance and for several reasons : primarily because it serves to localise the treatment more accurately to the part affected ; thus, in a case of neuralgia of the surface, if the painting of a mixture of liniment of aconite and menthol on to the affected part

will meet the trouble, what more is required? Again, if in a cough due to throat irritation a lozenge of cocaine and rhatany will stay the reflex, the *quod erat faciendum* of the problem is accomplished. Other examples of the local application will be the use of cocaine painted on to the mucous membrane ; of eucaine injected beneath the skin ; of the ether spray as a freezing agent, and so forth. In the next place the advantage of the local treatment is that it falls upon less noble structures, if one may use the expression, for one must look upon the nerve fibre and sentient surface as more stable and therefore less easily deranged than the delicate central structures with their intricate associations. In fact, the more the influence penetrates, the more does it come into relation with the complex association of parts which a central control makes indispensable, and so not only does its own action tend to spread, but it also endangers the delicate equipoise of a thousand and one parts. On the other hand, the method of peripheral treatment leaving untouched the central cell, this latter is intact in all its relational ramifications.

The second, or central method, is a direct appeal to the central cell. Action of this kind is exemplified by the inhalation of chloroform and of ether, by the opiate draught and the hypodermic injection of morphia ; and not only has this method lessened the risks of the operation, but it has freed the operator to a degree which alone could have made possible the great advances of modern surgery.

It were greatly to be desired that the central anæsthetic should be confined in its action to those cells which preside over the wounded area. Unfortunately this may not be, since the drug, once it has entered the circulation, is carried to every part of the system without prejudice. The peripheral structures hence are subjected in the same degree as the central parts to the influence of the drug, the only qualifying condition being the greater or less vascularity of the tissues severally. But though exerting its influence indifferently, the drug does not take effect equally, because the tissues are not equally susceptible, and it will be found, as a rule, that the more highly organised central structures are those which are most influenced, unless, indeed, there happen to be some special affinity, as in the case of curare poisoning. The preponderating central effect, however, still covers the whole body, including as it does brain and spinal cord, so that in order to exclude the perception of painful stimuli coming from a limited part, this central method is obliged to benumb the sentience of the whole body. This in itself is a wasteful procedure, but there are other objections as well, for the benumbing—*i.e.*, depressing—influence is felt by centres other than sensory, namely, the reflex centres of organic life. It is in the action upon these that we find the limitations of the central method of anæsthesia, for amongst them are two upon the integrity of which life depends immediately; they are the centres which preside over respiration and circulation. So long as the circulation is main-

tained and the patient breathes, we may for a longer or shorter period abolish the other functions in the sure knowledge that upon the elimination of the anæsthetic the annulled functions will return, but the moment the breathing or the circulation begins to fail we stand on the threshold of death, and the drug must be either withdrawn or more vigilantly controlled. Here, then, lie the objections to the use of the general anæsthetic; but, on the other hand, the obliteration of consciousness carries with it certain advantages, for with consciousness the imagination and the emotional faculties likewise take their departure, and in people of highly-wrought nervous system, as also under circumstances of great stress, these psychic workings are best excluded. Where the ego, the *animula vagula, blandula*, may abide meanwhile, during the period of anæsthesia, we need not stay to consider, for the question, "*Quæ in loca?*" is relatively unimportant so long as we are assured of a safe return.

Let us now return from the method of treatment of pain—the plan of attack, so to speak—to the need for such treatment. Thus far we have only dealt with the circulatory depression which pain may occasion, manifesting itself by syncope (fainting) or shock (collapse), either of which may prove fatal; but there are other reasons for combating pain. For instance, suffering may so hold the field of attention that there is room for little else. When this is the case it proves a grave disability,

because, the activities of the mind being held in check, the sufferer is for the time being quite unfitted to carry through the duties which belong to the healthy of mind and body. This is a very serious condition, and the more so because the use of analgesics to overcome pain carries with it a danger which may prove even greater than the disability caused by the unneutralised pain. To this we shall have to refer again under the heading of "Habit." Suffice it to say here that whilst it is perfectly legitimate to combat occasional acute pain by means of drugs, this justification grows more and more doubtful in proportion as pain tends to recur and become chronic. If the analgesic cancelled the pain and *did no more*, there could scarcely be any objection to its use however prolonged, but rarely, if ever, is a drug so purely antidotal as this. Indeed, were this the case the symptom and its antidote at close quarters would mutually cancel each other and disappear from the equation, as $+a$ rules out $-a$. Unfortunately, this is not the case, for, to give an example, if opium be administered in the treatment of pain, it is possible after the disappearance of the pain to trace in many ways the survival of positive opium-effects. These positive effects may be more or less disagreeable, and in that case the doctor and patient will have to weigh the good and bad results one against the other, and upon this decide whether to use or to refrain from the drug. No great harm will result from this form of residual effect, but it is otherwise when some of the

positive effects are actually pleasurable, when, in fact, the drug commends itself not merely by its power of negating, but by reason of its own pleasing individuality. It is welcomed now, not because it abolishes a distress, but because it establishes a delight, and therewith it has become a positive danger.

Further, pain may not merely disfranchise by holding the field of attention, and so diverting the patient from useful activities; it may directly interfere with natural and necessary functions. Sleep, for instance, may be seriously disturbed, and when this happens we shall have to consider carefully whether the harm caused by the want of sleep more than counterbalances the disqualifications which belong to the sedative.

It will not be necessary to vindicate the value of sleep, knowing as we do that it is a period during which the storage of force within the organism is in excess of the output of force. Sleep as a recuperative makes a renewal of activity possible, and is a basal condition of life. Elsewhere we have ventured the opinion that our soporifics, so called, do not bring with them any positive sleep-making impulsion, that they merely permit the tired cell to follow its own bent by removing those influences which thwart the natural movement. If this be correct, sleep will be an attribute of the living, working cell alone, and the soporific will merely facilitate the manifestation of this attribute. It is not pretended that the sleep obtained by the aid of drugs is of the same value

as natural sleep; the aid given by the drug will have to be paid for ultimately, in some form or other, as will every loan, but it is unhesitatingly asserted that in a very large number of cases the advantages presented by the soporific are so greatly in excess of its disadvantages as to make its use *on occasion* an imperative duty. Here, as in the treatment of pain as such, the question of time is all important. So long as we may in reason regard the disturbance as a passing event we may employ the hypnotic with comparative ease of mind; but should the mischief threaten a continuance of the pain, then it will be that hesitations as to the advisability of the soporific will arise. Of the value of the sedative as a sleep-bringer we shall judge by the refreshment bestowed, and not by any titillations of the fancy which may accompany its use, nor by any euphoria which may precede it; for soporifics may bring these gratifying sensations, and on these grounds may commend a drug in itself not commendable.

Treatment of those exceptional cases of progressive incurable disorder, with which the malignant tumours present us, must be considered separately and each upon its own merits. It would be a rash statement to make, that upon no consideration may a sedative be used in a routine way at the risk of the establishment of a habit, for it must be remembered that one purpose of medicines is to palliate, to make bearable. In a case, therefore, of inoperable cancer, in which pain should happen to be a prominent symptom,

it would be a hard saying that, for fear of creating an opium or a morphia habit, these medicines must be withheld. This constitutes one of the most difficult problems in treatment, and we can only say that, the whole circumstances of the case having been soberly surveyed—on the one hand the outlook as to the presumable course of the disease (recovery not being in sight), on the other, the subject of the disease, the man as a whole, and in particular the man from the higher or psychic point of view—the physician must then advise according to his better judgment. The chief danger lies in respect of the moral sense which habit jeopardises. This danger we shall best avoid by keeping the employment of the drug as far as possible to its use as a *corrective*, and by not permitting its abuse as a *stimulant*. To give relief it may be admissible, but as a provocative of pleasurable excitement it is not to be allowed.

In every case, therefore, in which circumstances seem to impel us towards the routine use of sedatives, their administration must be doubly and trebly safeguarded, for we may not usher out of life less of humanity than came under our care.

It has been said that pain is of mind as well as of body, and that anguish psychical may as urgently demand treatment as any form of bodily torment. This is quite true, but at the same time there is a much greater hesitation about

the use of sedatives to meet distress of mind than to overcome bodily pain, and quite rightly, since psychic distress is much more intangible, much more elusive, and at the same time far more closely bound up with the moral element in our nature. So close is this association that in the treatment of the *angor animi* the primary appeal should be first to the moral nature of the patient, or, should one say rather, the physician must himself first consider the question of the moral appeal. If it be decided that here also drugs may with advantage find a place in the treatment, then those same limitations that we have seen to be necessary in the treatment of bodily pain will restrict the use of the sedative—if anything, the restrictions will be more rigid.

But whether pain be of mind or of body, the one essential in the use of the anodyne will be its *controlled* administration—indeed, thus employed, drug treatment, instead of degrading the moral sense, may actually become a means of building it up; for the patient who accepts the restrictions as to the use of the palliative and is willing to bear himself resignedly until the time appointed for relief, is actually submitting to a form of discipline which may tax to the uttermost his powers of endurance, and which if endured cannot fail to strengthen his moral fibre.

In the use of the local, *i.e.*, peripheral sedative, the question of habit will arise to a far less degree, and this negative qualification may certainly be

added to the recommendations of that method. Need we add that, to whatever degree the risk of habit may attend the local application of a drug, the same considerations will have cogency as have just been set forth?

THE MEDICAMENTA SURVEYED

IT will not be out of place if at this stage we pass in review the ranks of the drugs which make up the *Materia Medica* of the present day. In so doing a complete list will not be attempted ; we shall content ourselves with a classification into primary groupings, illustrated by a few typical drugs belonging to each group. The aims and ideals of medicine will be set forth in this way far better than by any list, however complete, and at the same time we shall escape the charge of vain-glory which since the days of the numbering of the children of Israel has attached itself to a counting of heads.

As already stated, it is not possible to draw a strict line between the medicine and the food, in that certain remedies in general use must be regarded as virtual foods, though by common consent they are relegated to the drug list. Such are cod-liver oil and malt extract ; such is emphatically the egg-flip mixture of the *British Pharmacopœia* (the *Mistura Spiritus Vini Gallici*) ; such again, though to a more limited extent, glycerine and alcohol, and here also must be placed lecithin, a

phosphorus compound, found in the brain substance and a constituent of yolk of egg. That these medicines convey powers which are outside their plain food values, measured in calories, is quite certain, but that they do possess appreciable nutritional value is no less indisputable, and since they are administered in great part because of this value, therefore they are with advantage grouped in a special class as the Nutrients.

This class may be compared with the class of the fruits and vegetables among foods proper, for, in addition to their food-equivalence, these possess medicinal powers by virtue of the salts which they contain—witness the value of the juices of fresh fruits and vegetables in the treatment of scurvy. As, therefore, the vegetables and fruits will take rank as medicinal foods, so the nutrients will rank as food-medicines. Thus,—

Class I., the Nutrients, will be employed for the purpose of supplementing nutrition.

Ill-health manifests itself in a great variety of ways; the nutrition may not be obviously at fault, yet the tissues lack health. One such *mode* of ill-health declares itself broadly as a depressed vitality, the low level at which the functions stand being the prominent fact. Various medicines offer themselves as adapted to meet this state of depression; thus in cases of acute, *i.e.*, sudden, downfall we have the so-called *Stimulant* group, exemplified by alcohol, ether and the ethers, ammonia, the volatile oils (musk, for instance), caffeine (the active

principle of coffee), strychnine (from the *nux vomica*). These substances make a powerful impression upon the system, and thereby tend to lift it on to a higher plane of vitality. The treatment of the attack of fainting is a case in point; the treatment of the intense collapse caused by snake-bite is another instance: in either case the diffusible stimulants are employed with a free hand.

Other states of lowered vitality are less acute and less pronounced; in such there is nothing to which the term "collapse" would be applicable, as in the states just described. All that we can now record is that the organism is laggard in its behaviour; the stream of life sluggish. This condition is essentially chronic in its course, and relatively benign; death does not threaten, or only very remotely; it may, however, be hard to bear, for in the absence of all zest life does not invite—the condition is of every grade. The terms "asthenic," "atonic," are used to describe the state of the body in question, and the name *tonic* is applied to the drug which is able to combat the *asthenia* or *atony*. Much vagueness still exists as to the precise meaning of the word "tonic"; literally it signifies a something which tightens or braces up, the idea being that in *asthenia* the tissues are slacker than they should be. We owe this view probably to a consideration of the state of the muscles in *asthenia*, for in this undoubtedly they are relatively flabby and exhibit less of elasticity and spring. This holds for the skeletal muscles, as well as for those of organic life, for instance, the heart muscle and the muscle fibres of

the vessels and of the hollow viscera generally. The simplest example of tonic action, from this point of view, is furnished by the influence of cold upon the body, for hereby the muscular tissue generally is braced up, and, not improbably, other forms of protoplasm, which, though not labelled contractile, are capable of exhibiting states of more and of less tone. The action of a low temperature, especially if suddenly applied, is therefore spoken of as tonic, just as heat, particularly if more gradually brought to bear, is described as a relaxant because it brings about an opposite condition.

Asthenia may manifest itself no less strikingly in another direction, viz., in a depressed metabolism, understanding by this a lowered rate of chemical activity. In consequence of this the tissues exhibit syntheses which are slow and incomplete, and analyses to match, the result of these being a general instability, attended by stagnations and imperfect cleansings. Now, the drug or influence which will quicken the tissue exchanges must bring about a state of increased vigour of the entire system, and such action is deservedly named *tonic*; but whereas in the former case, that of the relaxed muscular fibre, the change wrought by the incitation seemed physical rather than chemical, now it is the chemical side of the problem which claims chief attention. Perhaps it is unwise to attempt a too strict dissociation of the physical from the chemical, and better that we should be content to define as *tonic* all those influences which bring about a higher physico-chemical vitality.

Tonics, like stimulants, constitute a sub-class, and both may be included under one heading as Incitants,¹ seeing that both bring an impulse, an incitation, to bear upon the body. We shall therefore have :—

Class II.—

Incitants	Stimulants	{	<i>a.</i> By increasing the tension or elasticity of the tissues. <i>b.</i> By quickening the chemical activities.
	Tonics		

As examples of tonics we have the mineral acids, *e.g.*, nitric, hydrochloric, sulphuric and phosphoric acids; the bitters, *e.g.*, gentian, calumba, chamomile; the special bitters, *e.g.*, cinchona and nux vomica, and their active principles, quinine and strychnine; some of the salts of the heavy metals, in particular the salts of iron and manganese; further, phosphorus combinations, especially the hypophosphites and the glycono-phosphates; and lastly, the arsenical preparations. Phosphorus and arsenic form thus a natural chemical and pharmacological group. Many other tonics might be instanced, but these will suffice to exemplify a class which has numerous representatives, some among which serve to fortify the whole system

¹ The term "stimulant" would have been preferable to the word "incitant" if the former had not been appropriated by the public to designate a certain group of bodies, the alcoholic group.

(general tonics), whilst others are more local in their action (special or local tonics).

Other terms are sometimes employed as equivalents for tonic action—thus the word *roborant*; the term explains itself as an invigorant and calls for no comment. It is otherwise with the word *hæmatinic*, much employed in describing the action of iron, a typical tonic. By hæmatinic we understand a something which builds up or improves the state of the blood; to the extent that iron, for instance, does this it will stand simply as an example of a special or blood tonic, but the blood reaches everywhere, and upon an improvement in its quality there soon follows a general improvement of the whole organism, and so the influence of iron is quickly generalised. How does iron work? This is a much more intricate problem than at first sight appears; at one time it was held that it just made good a deficiency of iron in the blood, but this simple view, which converted the tonic iron into a nutrient pure and simple, does not work out so simply when the attempt is made to follow the steps of the hæmatinic process, in the course of which admittedly the blood does improve in its percentage of iron-holding. This matter we may not pursue, but must be satisfied with recording the improved tone of the body, along with the visible improvement in the quality of the blood, which naked eye and microscope alike declare, and both of which iron brings about: this combined action is conveyed by the word *hæmatinic*.

We would take this opportunity of saying that

most drugs are complicated in their mode of action, that they bring with them a sheaf of activities, and that we must not be surprised to find that one and the same substance is classifiable under more than one heading, according as one or other aspect of its influence is selected for its consideration.

In the foregoing list of tonics phosphorus and arsenic take rank as metabolic incitants in virtue of the stimulus which they appear to impart to the chemical activities of the tissues. This incitation is more pronounced for the less saturated compounds of either element—the hypophosphites and the arsenites acting more energetically than the phosphates and arseniates. In contradistinction to this vigorous metabolic quickening is the action of such medicines as the mineral acids, which we are accustomed to regard as physical rather than chemical in their *modus operandi*. The list illustrates, therefore, both divisions (*a*) and (*b*) of the group of tonics.

The next class of drugs is intended to meet states of the body which seem to indicate an excess of vitality. This is a conception difficult to make room for, viz., that there should be such a thing as too much vitality; and in truth that which we are pleased to describe as over-action, and qualify by the prefix *hyper*, is found upon investigation to be really an instance not of excess but of deficiency—at least in so far as the *whole* organism is concerned. Let us examine this.

We speak of *hyperæmia*, *hyperæsthesia*, *hyper-*

trophy, and these terms do really describe the presence here of an excess of blood, there of an undue sensitiveness, and here again of an overgrowth of certain of the tissue elements ; these states, however, depend, in the first instance, not upon the presence of too much vigour, upon a vitality in excess of the average, but are due to a withdrawal which has disturbed the physiological balance that characterises health. Just as little as a town riot, to whatever excesses it may proceed, is to be regarded as an indication of municipal strength, just so little does riot in the tissues, however violent the local disturbance, give proof of systemic vigour : on the contrary, both the one and the other mark a loss of control, and the class of remedy which we are now called upon to consider is that which is adapted to meet this state of *ill-controlled vitality*.

Now, theoretically that which we need should be of the nature of a tonic, whereby the forces of law and order might be strengthened, and this form of treatment is indeed called for, but in a majority of cases as a preliminary, and to the end that control may be reinstated it is necessary first to attack directly and actively the tumult itself and subdue its violence. The means requisite for this will be such as are capable of lowering or reducing an excitement, and these give us—

Class III.—The Depressants.

Familiar examples of this class are furnished by bismuth salts, weak solutions of the carbonates and bicarbonates of sodium and potassium, the less soluble carbonates of lime and magnesium in sus-

pension, opium or morphia in small dose, also small doses of hydrocyanic acid and of the cyanides : such singly or in combination, *secundum artem*, are much used in the treatment of inflammatory and irritable states of the alimentary tract. For similar states of the respiratory tract we have such drugs as potassium iodide, preparations of antimony and aconite, and again opium in some form. For states of nervous excitement we have the large class of the bromides, chloral hydrate, chloroform, and on occasion such remedies as sulphonal or veronal, with again opium and its derivatives, also Indian hemp. For the general state of fever we have a host of antipyretics—quinine, the salicylates, antipyrin, antifebrin, and so forth.

That state which we label hypertrophy—we are not speaking of mere enlargement of an organ or part—this we do not as a rule attack ; it is in many cases, perhaps in all, a reparative, *i.e.*, compensatory, response to disease, and we have neither the desire nor the power to influence its working except by reinforcing the vigour of the system, in order that the response may be as perfect as possible.

Before leaving this class, the Depressants, we must again impress upon the student that their application is not unto the whole system, not unto the controlling forces of the body—these are already in default—but unto the part or parts which have escaped from control. To arrest the cavalry unit which has broken loose, the effective remedy will be applied, not to the entire regiment, not even to the unit as a whole, man and horse, not to the rider,

unless it should be possible to put more power into his arms, but to the steed, and the nature of this remedy will be such as will depress or curb the runaway forces.

It will be quite clear that in every case of uncontrolled vitality the remedial call which the *controlling* forces make is to the preceding class of the incitants, viz., the stimulants and tonics, and that in so far as these may be applicable they should be applied; indeed, the ideal treatment will include the joint use of depressants and of stimulants judiciously directed.

Another familiar form of morbid action shows us a vitality which we cannot describe as lowered nor as uncontrolled, yet which is distinctly unsound. In such cases, whilst there is no apparent lack of living energy, neither is there the turbulence of open rebellion. The aspect of things is rather that of forces which, without being plus or minus in quantity, have been diverted from their proper channels, a wrong bias having been impressed upon them—this state we may name briefly a *perverted vitality*. It will be said that misdirected force is force improperly controlled, and so true is this that, if it should commend itself to some to place this form of unsoundness under the preceding heading of uncontrolled vitality, no objection can be raised, provided that we recognise here a distinct variety of morbid action, for the point is that depressants are now not called for. On practical grounds, therefore, we prefer to recognise here a distinct class, that, viz., of *perverted*

vitality. A simile may perhaps serve : a locomotive which through some fault on the part of the metals is deprived of their restraining influence, ploughs its disastrous way in open conflict with its surroundings, whereas a locomotive which through faulty handling of the points has been shunted on to the wrong track pursues the even tenor of its way, controlled and in full harmony with its new path ; there is no rebellion, no loss of control, it is still guided, but it has been misguided, and it finds itself at Boston when it should be at New York City, and that is just where the mischief lies. To take a concrete example, in the gouty habit we recognise the presence of a morbid bias which, in times of stress particularly, is wont to declare itself, and which calls for direct and special recognition. The subject of this habit exposes himself to chill and gets a bronchitis, but it is a gouty bronchitis ; he lives not wisely but too well, and he develops a skin affection, but the eczema, if such it be, is not a simple but a gouty eczema. There it is in the system the gouty taint, impressing its own characters upon the natural forces of the body in their reaction to external circumstances.

What is it that thus diverts from the right path? Something it must be, and in not a few cases it would appear that this something is, or has been, a poison of a kind—the state, therefore, to be regarded as the result of a toxæmia past or present. But, putting aside the theory of its causation, there is a class of drugs credited with the power of overcoming this perverted vitality ;

the designation *alterative* has been given to this class. Confessedly the term is vague, so much so that the exacting mind of the modern scientist has rejected it with contempt: *alterative*! what does it mean?—anything and everything you please. The criticism is just, and yet the word has the sanction of custom, and until we can see a little clearer, may we not advantageously retain the term to denote a class of drugs the function of which, unlike the Incitant which rouses, unlike the Depressant which lowers, is to change, to *alter* the direction of activities which somehow are on the wrong tack? Is it wise to refuse to look upon the mask which conceals until we have some promise of a glimpse of the real features behind? Allowing the provisional retention of the term, we have—

Class IV.—The Alteratives.

The members of this group are probably very numerous, possibly as numerous as the medicamenta themselves; in other words, it is probable that all remedies, even those which stimulate and depress, do alter to some extent the path of morbid action. Curiously enough, neither the Brunonian theory nor the doctrine of Contra-Stimulus, though devised to cover all disease and its treatment, found any place for alterative action.¹ The most striking examples of alterative action are given by mercury,

¹ See Pereira's "Materia Medica," vol. i, pp. 99, 100 *et seq.* See also Trousseau et Pidoux, Introduction to their "Traité de Matière Médicale." The Brunonians saw stimulation only in degree of more or less; the advocates of Contra-Stimulus supplemented the Brunonian theory by the admission of the negative of stimulus, *i.e.*, depression: neither saw qualitative differences in the action of drugs.

iodine, and arsenic ; on occasion colchicum furnishes a marked instance, but perhaps the most surprising example of this kind of action is to be found in a remedy of recent acquisition, viz., thyroid gland substance, which is positively amazing in its influence upon the disease myxœdema. We know now that in the last-named affection, the perverted metabolism is the result of a withdrawal from the body of an internal secretion, that of the thyroid gland, and that the cure, as far as cure is possible, follows the administration of extractives from the defaulting organ (obtained from animals). The theory upon which the thyroid extract has become the specific for myxœdema is simplicity itself, and we may hope that in the course of time, as explanation of the mode of action of alteratives is forthcoming, the group will gradually disappear.

We must pass to consider another variety of morbid action which the last fifty years has brought into great prominence ; it shows us *vitality in conflict*, actively opposed. Septic action in its length and breadth belongs here, and the more the subject is investigated the more does the sphere of activity of the germ expand, until for some the germ theory of disease seems to monopolise the field of vision. Vitality in conflict may appear now as the most limited of local diseases, as, for instance, the patch of ringworm ; now, still a local disease but threatening to spread, as an inflammation of the central parts of bone, or, as it is called, an osteo-myelitis ; and now as a pyæmia, the blood-stream having become infected

from the osteo-myelitic focus. But whether it be as the patch of ringworm or the tuberculous gland, *i.e.*, as a small and strictly limited affection, or as an area of activity of considerable magnitude, as in the case of the osteo-myelitis and the tuberculous lung; or, finally, as an affection of the whole system, as in pyæmia and acute miliary tuberculosis, in each case we see two vitalities in opposition and striving for the mastery—the higher vitality of the tissues pitted against the lower vitality of the germ.

To meet this form of morbid action a large and ever-growing list of remedies is provided. These constitute—

Class V.—The Antiseptics.

The problem of the antiseptic method of treatment is to find the remedy which shall effectively antagonise or destroy the hostile germ without seriously impairing the vitality of the tissues: this, owing to the selective affinities of germ and tissue, is possible. Thus when we administer quinine in efficient dose in malaria the germ succumbs with very little inconvenience to the tissues, but unfortunately, whilst this example points the way by demonstrating the solubility of the problem, yet in the great majority of the general infections we are still in search of the innocuous remedy which shall destroy or inhibit the specific microbe. The problem is much more simple when the infection is well localised, for the surgeon's knife has taught us how in the interests of the whole the part may be sacrificed, and accordingly in the use of antiseptics we often deliberately damage or destroy the tissues along with the infecting germ, knowing that the *local* destruction is the

price which must be paid for efficient disinfection, and that it is worth our while to pay the price.

It would be waste of time and space to attempt to give a full list of antiseptics, but we may mention a few of the more important. They are : boric acid ; compounds of sulphur ; compounds of chlorine, bromine, and iodine ; formalin ; carbolic acid and carbolates ; mercury preparations ; turpentine and the whole class of volatile oils. In addition to these there is a constantly increasing list of synthetic products.

These various modes of deranged vitality—*depressed, uncontrolled, perverted, and in conflict*—will perhaps cover the field of disease ; if so, then, setting aside the class of nutrients as belonging to the foods, this field will be covered therapeutically by four classes of remedies, viz., *Incitants, Depressants, Alteratives, and Antiseptics* ; but man is a subjective being, and his subjectivity is subject to these modes of vitality, although they may continue apart from consciousness. A fractured spine may so injure the spinal cord that the patient is entirely unconscious of, say, the lower half of his body ; in this lower half, however, a somatic life will be carried on which may exhibit here or there the above-named four modes of vitality, themselves controllable by the four corresponding classes of remedies, but neither upon the disease nor its treatment will the man's subjectivity attend in this lower half, whilst in the upper half the attendance of consciousness upon somatic life will mark the contrast. Have we any remedies which will address

themselves to consciousness in its modality? Certainly we have, and they are all-important to Mankind, which has named the morbid process *disease* because its subjectivity is troubled. Disease or pain—the terms are synonymous—is the state which now calls for treatment. Pain may accompany this or that form of disordered vitality; to the patient this is immaterial—he asks for relief. Restore the vitality, bring it back to health, and the pain will depart—possibly, probably; but restoration is a matter of time, and it is often tedious to wait whilst the incitants or tonics are battling with the mischief, and meanwhile there is the pain of which the patient makes his complaint. For this troubled consciousness medicine presents a class of remedies which soothe or palliate, and so render bearable the malady. We have in them:—

Class VI.—The Sedatives (*sedare*, to allay or assuage).

The sedatives may be used for three definite purposes—first, to allay pain: the drug which typifies this action is opium, and the term *anodyne* is often employed to name this action—it implies the presence of pain; secondly, to anticipate or prevent pain by abolishing sensibility—the term *anæsthetic* is employed to characterise this use of the sedative, and chloroform and ether typify the anæsthetic; thirdly, to secure sleep—this action is expressed by the word *hypnotic* or soporific. It is a moot point how far this third purpose comes under the heading of sedative, for sleep is the result of a natural movement of the tired cell, and it is doubtful whether any drug brings drowsiness

as such—whether it can impress upon the cell that bias towards quiescence which a preceding activity brings of necessity. Be this as it may, we find in practice that the use of the sedative is followed by sleep, sometimes apparently in consequence of the removal of a let or hindrance, such as a pain or a troublesome reflex—a cough, for instance; these being removed, the body glides into sleep; at other times no such obvious reason for the soporific effect is forthcoming, the hypnotic evidently facilitating the sleepward trend, but how or why we are not able to say. This question of the proper placing of the hypnotic may for the present be left open, but on the grounds of convenience it may provisionally stand here along with the sedatives. Drugs illustrating this mode of action are chloral hydrate, sulphonal, veronal, paraldehyde, to name a few among many others which stand as pure hypnotics; of course the sedatives proper, such as the bromides and opiates, come into the class.

Before leaving this subject it may be well to point out that though the idea of allaying and assuaging carries with it a sense of abating and reducing, yet the sedative is something quite distinct from the depressant. For the great majority of people the sedative action of opium is unquestionable, but it is certainly not a depressant within therapeutic limits; moreover the word “sedative” stands related essentially to consciousness, whereas the word “depressant” as here defined conveys no such meaning.

Drugs are often classified upon the basis of their selective affinities, *i.e.*, as they may single out this or that tissue or organ to act upon. Thus they are spoken of as diaphoretics, diuretics, emetics, cathartics, &c., according as their incitation is felt by the skin, the kidneys, the stomach, and the intestine. But this classification does not consider quality of action, it is simply an illustration in detail of the action of Class II.—the incitants. We need not therefore dwell upon this plan of ordering, useful as it is on other grounds.

Again, specific departures from health may form the basis of classification, certain well-defined groups of remedies having been found adapted to their cure; there are remedies, for instance, which are in repute in the treatment of gout, of rheumatism, of malaria, &c. Sometimes the departures from health consist of groups of symptoms, which we regard as morbid entities, each group constituting a separate disease; at other times the departure consists of one symptom only, such as a constipation, a diarrhœa, a cough, a raised temperature: in the latter instances it would perhaps be more correct to say that the treatment is addressed to one symptom only. In either case, whether the treatment be named after its power over the specific disease, *e.g.*, anti-rheumatic, anti-periodic, or its power over the specific symptom, *e.g.*, laxative, anti-pyretic, such classification tells us nothing as to the mode of action of the drug, *i.e.*, how the effect is brought about, and for the moment that alone concerns us.

Rejecting this mode of classification also, we come

back to the ordering suggested in this chapter, according to which drugs claim to bring aid to the body in one or other of the following ways or in a combination of these ways:—

I. As Nutrients.			
II. As Incitants	acting as	$\left\{ \begin{array}{l} \text{Stimulants} \\ \text{or} \\ \text{Tonics ...} \end{array} \right.$	$\left\{ \begin{array}{l} a. \text{ By increasing the} \\ \text{tone of the body.} \\ b. \text{ By quickening the} \\ \text{chemical activi-} \\ \text{ties.} \end{array} \right.$
III. As Depres- sants		$\left\{ \begin{array}{l} a. \text{ By lowering the tone or tension of the} \\ \text{tissues.} \\ b. \text{ By reducing the chemical activities.} \end{array} \right.$	
IV. As Altera- tives	By guiding a perverted metabolism health- wards ; not, therefore, by augmentation nor by subtraction from the forces of the body, but by a right direction.		
V. As Antisep- tics	By antagonising the hostile forces of an opposing element.		
VI. As Sedatives	By mitigating or assuaging the subjective distress which attends upon the somatic disturbances of ill-health ; briefly, by allaying <i>dis-ease</i> .		
A. Objec- tively.			
B. Subjec- tively.			

This claim is of great pretension. Can the therapist substantiate it? He must, for he can be content with nothing less.

THE "NEWER" THERAPEUTICS

IN a preceding chapter the subject of the Newer Therapeutics has been glanced at, and the judgment hazarded that the title is scarcely justified, if by it we are to understand a new departure breaking the traditions and the methods of the past. "Nature makes no leap," and man's work, which is of Nature, conforms to the rule; accordingly we find upon investigation that there is here no hiatus, no separating chasm, but that the principles which the newer methods exhibit are the same as those which underlie the older procedure. The advance of knowledge is, however, of uneven pace: now quick, now it would seem to halt or even to be retrograde, and now again its movement is direct, unfaltering, swift. During the last few decades the rate of movement in the department of the *Materia Medica* has been particularly rapid, and for this reason, and because also of the clearness of the leading, the newer therapeutics may justly claim our special consideration.

The subject divides itself quite naturally into two parts, Organotherapy and Serumtherapy, and concerning these, the physician's latest acquisitions, so much is predicated now, so much more predicted for

the hereafter, that the student who clings to the past, whose faith is deeply rooted in it, becomes a little anxious as to the solidarity of the whole scheme, and he begins to question within himself whether these *mirabilia* will fit into the scheme or must be relegated to a new order of things ; whether new wine-skins should be got ready for this vintage so full of promise or whether the old skins will serve ; whether, finally, the older armoury is to be regarded as out-of-date and not worth furbishing up in view of these newer and keener weapons.

Organotherapy comes first for consideration. If we consult the pages of the "British Pharmacopœia," even of the last edition, we find that this subject, with few exceptions, is signally unrepresented, but if we turn to our Extra-pharmacopœias, *i.e.*, to the remedial registers which set forth the practice of the day, we find therein a long tale of remedies which thirty years ago we should have sought for in vain. These remedies are derived from the organs and tissues of the animal body, whence the name organotherapy ; behold them : red bone-marrow extract, extract of brain and spinal cord, extracts obtained from the alimentary tract and its appendages, secretin, pancreatin, extracts of spleen, of suprarenal capsule, of thyroid, of thymus, and so forth ; indeed, there is scarcely an organ or tissue upon which a therapeutic toll has not been levied, and the results of experiment with these extracts have in some cases served to bring into functional prominence parts hitherto overlooked or deliberately ignored—witness the pituitary gland. One organ

or part has persistently given no promise of service of this kind, to make up for much dis-service, viz., the appendix.

Here truly is a striking contrast between the practice of the hour and that of a generation back, but if we look at the medicine, not of thirty or forty years ago, but of many hundred years since, we find a far larger call upon animal tissues and animal products than the "British Pharmacopœia" now makes; the second book of Dioscorides, for instance, has a long roll-call, to which among others the earthworm and the snail, the crab and the scorpion, the hare, the stag, the beaver and the hippopotamus answer; nor are these instances sufficiently representative of a list which includes, further, the frog and the salamander, the lizard, the grasshopper and the spider, nay, even the domestic cimices *qui in cubilibus enascuntur*, and Herrick's "small deer," the shrill-voiced mice *qui in domibus oberrant*: these also help to swell the *adsum* chorus. The copy of Dioscorides from which this list is taken was printed at Lyons, *cum privilegio regis*, by Balthazar Arnoullet, in the year 1550, by which time organotherapy had had, it must be allowed, a sufficiently long innings. Among other animal products to be found in the same book are *œsypum* or wool fat (*cf.* *Adeps lanæ*, introduced into the "B.P." in 1890!), marrow, bile, blood, and certain secretions.

After so many centuries of currency the *Materia Medica* of Dioscorides might surely take rank as official, but it is certain that it would not cover the

field of everyday practice of that period, and, as late as the year 1677, we find in a work by Dr. William Salmon, styled the "New London Dispensatory," various animal preparations such as cor hominis (powdered), the heart of the ox, the stag, and the pig; the liver of the wolf, the otter, and the frog; the marrow of the goat, the ox, the stag, and the calf. At this same date a number of preparations of mummy were in use, and a preparation of the human skull, viz., the *Spiritus Cranii Humani*, was employed in the treatment of so distinguished a patient as King Charles II.¹

As time went on the animal kingdom, in so far as official practice went, began to shrink in dimensions, until, in the issues of the "British Pharmacopœia" of 1867 and 1885, it reached its minimum. It is true that musk still figured in these, but it was scarcely ever used (castor had been omitted from the 1885 issue), and so, with the exception of the little employed ox bile and pepsin, introduced in the Additions of 1874, organotherapy as now understood had vanished completely.

How is it possible to explain this change in opinion and practice? There can be little doubt that the same fundamental conception underlay the practice of the ancients as now underlies modern organotherapy, viz., that the organs of the animal body possess severally special powers which they

¹ See Dr. Arthur Davies on Organotherapy in the *Lancet*, 1902, vol. i, p. 1089. Dr. Davies suggests that Dr. Salmon's work must be regarded as a kind of extra-pharmacopœia, and therefore as embodying current practice.

contribute to the economy, and that these powers are available for the benefit of man. There is as little doubt that this conception is essentially true, and yet, after fifteen hundred years of practice, organotherapy dies out—why? Because the conception, though true in the main, was entirely undeveloped in detail. The cannibal who ate the heart of the brave whom he had slain in combat committed an indiscretion—or shall we say an error of judgment?—for the valour of his enemy did not inhabit the central organ of the circulation; in like manner, through an error in the correct allocation of the virtues sought, the ancients misapplied the general proposition which they had secured. This misapplication was all along the line, since physiology in any real sense did not exist in those days, and the wonder is that the discredit which was bound to come was so long in coming—it would have made its appearance centuries earlier if Authority had not held its head so high, and taught so dogmatically *ex cathedrâ*.

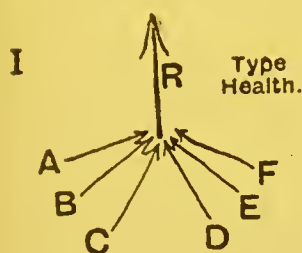
It was reserved for Brown-Séquard, in 1869, to lay anew the foundations of organotherapy upon a physiology based on careful observation. He insisted upon the free communication of all organs with the system at large *viâ* the lymph and blood-streams, and taught the doctrine of “internal secretion.” The ductless glands, thymus, thyroid, suprarenal, and others, became forthwith full of significance, and by an application of the same doctrine to the glands with ducts—*e.g.*, the liver, the pancreas, the kidneys—the significance of these

gained greatly in importance. It now became apparent that the excretory ducts of an organ, such as the liver, could not convey all the virtues of the gland, but that the potencies of an internal secretion must be added thereto if one would rightly estimate the full physiological value of the organ. Upon these lines research is being actively pursued at the present moment, and there is reasonable prospect of valuable gains to come in addition to those already secured. We have long learned to recognise that in many forms of disease organic failure here or there is an obvious causal accompaniment, but it is only recently that we have begun to see in the perturbations of the disorder an effect, pure and simple, of the withdrawal from the system of certain secretory products of the particular organ at fault; to see, in fact, in the perturbations a disturbed balance, the result of the withdrawal. Regarded thus, the application of the teachings of physiology became direct in every case in which it could be proved that we had to deal with an organic atrophy and consequent functional default, and with this alone; it became our duty without delay to supply the missing virtues. But whence should these be obtained? The unity of Nature's scheme suggested that the bodies of animals might furnish the needful, and forthwith, with an altruism in which, perhaps, some element of compulsion might be discerned, the animal kingdom came forward and placed its body corporate at man's disposal. The brilliant success which attended the treatment of particular forms of thyroid failure

known as myxœdema and cretinism was achieved by the administration of the thyroid glands of sheep or cattle, or of preparations of these glands. This treatment may stand as the type of one form of organotherapy—that, namely, of *defaulting* organs; of this it is the best example possessed by us at present; its excellence is at once the standard to which we pretend and the warrant for the further prosecution of treatment on the same lines.

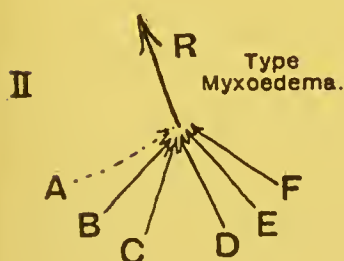
Organic disease may be of a kind just the reverse of that we have been considering; instead of functional default it is functional hyperactivity which now presents itself. The result is, of course, a disturbed balance, and as an instance of the kind we may cite Graves' disease. Organotherapy has risen to the occasion, in theory at least, and in the following way. It is argued that in health the internal secretion of the thyroid strikes with the other internal secretions of the tissues a balance, which stands as the equilibrium of health. The composition of forces which this balance manifests must involve the counteracting, more or less, of certain other internal secretions, for they cannot all be co-operating. If now the thyroid be *hyper*-active, some of its secretory activity must be unneutralised, uncompounded; to meet this it is proposed to administer a dose of those internal secretions which may be termed *antithyroid* in their action. These antithyroid activities are obtained by removing the thyroid gland from certain animals and after an interval collecting the serum from their tissues; these tissues will be saturated with products

which have gathered in the system during the absence of the thyroid gland, products which, being unneutralised by the thyroid, are potentially opposed to it. The use of the milk of thyroidecto-



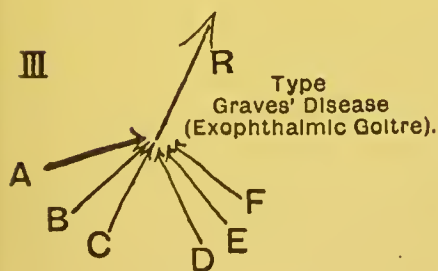
TYPE, HEALTH.

Fig. I. represents the standard of health. The forces A, B, C, D, E, F represent the activities of the internal secretions severally; R = their resultant or component effect.



TYPE, MYXŒDEMA.

Fig. II. represents a deviation from health by *defect*. The internal secretion A makes default, and in consequence the resultant R deviates to the left. The disease myxoedema will be of this type.



TYPE, GRAVES' DISEASE (EXOPHTHALMIC GOÏTRE).

Fig. III. represents a deviation from health by *excess*. The internal secretion A is now augmented above the level of health (the darker line indicates this); in consequence the resultant R swerves to the right.

mised animals in Graves' disease is thus another illustration of the use of organic extracts. The theoretical importance of these two forms of organotherapy is such that it may be of advantage to represent them diagrammatically.

It will be manifest that the direct treatment for

the State II. is either by direct reinforcement of A, as by the administration of thyroid extract in myxœdema, or by the use of some extractive, some quintessence, derived from the tissues generally of an organism in the condition represented by State III.

In like manner the remedy for State III. will be an extractive—*e.g.*, blood serum—or some secretion, such as milk, derived from an organism in the condition of State II.

It would be out of place to enter more in detail into the practice of organotherapy, its successes and failures; these two examples illustrate sufficiently clearly both theory and practice, and they justify amply a hopeful persistence on the same lines. The animal kingdom is thus re-entering the Pharmacopœia: Dioscorides is coming back to us, but it is a chastened, a regenerate Dioscorides. It must be confessed that not a few examples of modern organotherapy smack of an unregenerate past, and that others which appear to be really useful have no *rationale* at their back; of the former we may cite the use of extracts of brain and spinal cord and of the retina; of the second variety, the useful, we may mention red bone-marrow extract and suprarenal extract. With reference to the last named it is necessary to state that the pathology of the severer forms of anæmia, in which successful results have been obtained, is too uncertain at present to make the use a rational one, and that the extensive employment of suprarenal extract, except in the case of Addison's disease, is not more rational than the employment

of other drugs—*e.g.*, digitalis, ergot, and the like.

In the face of historical record the claim of organotherapy to be something modern must clearly be abandoned; it is otherwise, however, in respect of the claim that the plan or method upon which animal extracts are now employed is new, which may very reasonably be advanced. But though we accept this without cavil, even so, it is necessary that we inquire upon what grounds we label it new, and why we separate organotherapy from the administration of, say, arsenic, or iron, or strychnine, or digitalis. We have reached the position that each organ elaborates in its workshop certain principles, and that for the employment of these principles we have learned, in a few instances, the strict indications. These principles, what are they? Are they something essentially distinct from the principles governing the employment of the arsenic, iron, and strychnine of our pharmacies? Already chemists and pharmacologists are in full cry after the active principles of organic extracts, and in the case of the thyroid gland we have its activity referred to extractives, such as the thyro-iodin of Baumann, thyro-antitoxin of Fränkel, thyroglobulin of Oswald, &c. These researches, it is not to be doubted, will be successful in the end; certain it is that we shall not be satisfied till they are—not satisfied, that is, until the activity pursued has been run down to something definite in carbon, hydrogen, oxygen, and nitrogen, with perhaps iodine or phosphorus or other

element superadded; something with a formula that we can write upon the blackboard and torment in a test-tube; something that we can crystallise out, can put in a bottle, and label. And when we shall have done this, upon what grounds shall we separate this bottle from the other occupants of the druggist's shelves? On the ground of its derivation from vital tissues of a high degree of specialisation? on the ground of the complexity of the molecule and its instability? We know well that all these reasons are fallacious and, at the utmost, stand for differences in degree, not in kind; whilst as for instability, that is no necessary part of complexity, provided we can shut out disturbing forces: Newton has taught us this, and we see that it must be so. We hear of mummy wheat which has germinated after a thousand years and more of isolation, owing to an immanent vitality, and whether this be true or not, there is no reason why it should not be true, Hermes Trismegistos favouring. In like manner there is no reason why the most unstable of organic extracts should not keep its full potentiality, immutable as a piece of carbon, time without end, if only we secure the aid of "Thrice Great Hermes."

That there is more of reason in the treatment of myxœdema by thyroid extractive than there is when we administer arsenic in a case of pernicious anæmia, or foxglove in a case of heart failure, *i.e.*, that the mind follows and approves in the one case, instead of merely accepting, as in the other—this is true. The disease myxœdema refers us at once to

a particular drawer in Nature's pharmacy, and we see why; the pernicious anæmia and heart failure also refer us to particular drawers, but the reason is more obscure to us: here, however, is surely no ground for separation, for we must hold that the *why* will not always be withheld. No; Nature's laboratory is as responsible for the rock sulphur of Sicily, the iodides and bromides of seaweed, the strychnine of the nux vomica, the digitalin of the foxglove, as it is for the thyro-iodin of the thyroid gland and the adrenalin of the suprarenal capsule.¹ These elements and elemental groupings are all one in their derivation from Nature.

It is curious that the pretension to novelty in action has waited upon the development of an internal secretion doctrine, yet there is no more merit in an internal than in an external secretion. The official use of pepsin came in 1874, of thyroid gland substance in 1898—just a quarter of a century after. The administration of pepsin to supplement an inefficient gastric secretion was in itself so reasonable a procedure, so self-explanatory, that it needed no comment, and no claim to a new departure in practice was made; but the case of a recently discovered potency of the thyroid gland, till then unsuspected, opened up so large a domain in physiology and so spacious a field of therapeutic applica-

¹ As already hinted, the use of suprarenal gland extract as a styptic or vascular tonic is in no sense a new therapeutic departure; it is just as rational or irrational as the use of digitalis and of ergot for similar purposes.

bility, that it was the case over again of the discovery of a new world, in which, of course, a new principle reigned. However, if we come to look into the matter, it is apparent that to supply thyroid activity in a case where the thyroid gland is inadequate is not more a new departure than to supply pepsin where the stomach fails to secrete effectively. This criticism does not in the least detract from the great merit due to the accurate observation and painstaking researches which the recognition of the true nature of a disease such as myxœdema has involved, nor does it make light of the great labours which the study of the internal secretions has demanded and still demands.

Rational organotherapy is a system of treatment based upon *physiology*, the remedies being certain extractives obtained from healthy tissues ; in contradistinction to this, serumtherapy is based upon *pathology*, for the remedies in use now are the outcome of morbid influences, which, however, have been so modified in their incidence that the emergent activities are available for therapeutic purposes.

The human organism, all organisms, are started on their career in the midst of a host of hostile elements, which at once give battle. Under such circumstances the result would be a foregone conclusion unless the elements of vitality with which the organism is endowed were capable of an adequate resistance. As it is when the "Allez, messieurs" starts the fray, there follow attack and

parry, *riposte*, and counter-attack in quick succession, the issue of the contest swaying now this way, now that.

Among the hostile elements in question we have learned to recognise the great part played by the micro-organisms of infection. These *minimissima* appear to work by means of certain chemical products which they develop ; herein lies their sting, namely, in the poison or toxin which they elaborate. The counter to a chemical attack must itself be chemical, and so the tissue *riposte* is another chemical product which is able to neutralise the toxin ; this is called the antitoxin. Toxin and antitoxin conform in their behaviour to Newton's law of action and reaction—toxin generating antitoxin ; as elsewhere we have expressed it, the antitoxin is the tissue rebound. The first fact, then, which concerns us in relation to seropathy is that the incidence of the toxin-bearing germ is met by a tissue reaction which develops an antitoxin—Nature's own antidote. If the antitoxin is sufficient in quantity and quality, the infection is successfully opposed—the disease subsides or aborts and convalescence follows. This, Nature's treatment, is often a hard and prolonged struggle, and only too often it is ineffectual, either because the dose and the virulence of the poison are too great or because the tissue reaction is too weak, and the question accordingly has arisen whether it might not be possible to supplement an ineffective reaction by furnishing that which was lacking in antitoxin. But whence and how obtain the antitoxin ? Again

the animal kingdom has come to the rescue, it having been found that certain animals are susceptible to the same infections as man and respond in like manner, elaborating within their bodies an antitoxin which answers the required purpose. Forthwith a new industry arose, viz., the fabrication of antitoxins; the animal body became now the factory in which, upon the introduction of the raw material, the toxin, in carefully controlled supply, the antitoxin required was prepared.

Perhaps the best example of the antitoxin treatment is that in use in diphtheria. The animal selected for the development of the antitoxin is the horse, and the method is as follows: A dose of the toxin, well below that which experiment has found that the horse can tolerate, is injected; after an interval the injection of a somewhat larger dose is made, and so on at intervals the injections of larger and larger doses follow, until the animal has been rendered sufficiently immune for the purpose, *i.e.*, sufficiently resistant to the poison of diphtheria. The immunity thus established is due to the reaction of the tissues to the poison, which reaction takes the shape of an antitoxin, which is gradually elaborated, in greater and greater quantity, in response to the rising dose of toxin: the antitoxin is found to be abundant in the serum of the blood, and accordingly this serum is selected and it becomes our medicamentum, or remedy for diphtheria. The use of the remedy is as purely antidotal as the administration of a dose of alkali by the mouth in a case of acid poisoning, *e.g.*, so

much of the corrosive acid in the stomach, so much of alkali to neutralise it, and in like manner so much of the toxin elaborated by the bacilli swarming in the tissues of the diphtheria case, so much of the antitoxin contained in the serum of the immunised horse to antagonise the toxin. But, it will be said, the body of the person who has contracted diphtheria is itself opposing the toxin and developing its own antitoxin; why not leave the organism to its own devices and resources? For the simple reason that we cannot count upon a successful issue to the contest, the organism succumbing only too often either to the magnitude and intensity of the dose of poison, or because of the feeble reactive powers of the tissues, which limit the output of antitoxin. Under these circumstances, and in order to minimise risks, we reinforce the natural powers of the body by a supply of the artificial antitoxin.

Now it will be clear that there must be some difference between those cases in which the patients have, so to speak, worked out their salvation, fighting the battle to a successful issue by their own unaided powers, and those other cases which, during the struggle, have been assisted from without. In the former instance the whole brunt of the hostile influence will have fallen upon the tissues, and the reactive process by which the antitoxin has been wrung from the tissue-elements will of necessity have modified them in exact proportion to the reactionary effort. The tissues will thus be left changed, more or less, and experience has

shown that in this changed state they are less responsive, less susceptible to any fresh dose of the original poison ; tissues so altered are said to be protected or immune, it being well understood that the immunity is of more or less degree. This kind of behaviour is by no means limited to tissue-elements and microbic influences ; the body politic of the great world exemplifies the same workings in the interactions of kingdoms and states. Thus, during the Revolt of the Netherlands, Holland in general, and the town of Leyden in particular (after it had successfully withstood its twofold siege in 1574), must have accumulated a great store of anti-Philip-toxin, and though it is to be suspected that this special form of antitoxin owns no formula in carbon, hydrogen, and oxygen, but will be found to lie somewhere among the imponderables, yet in its conformity to the great law of action and reaction it presents its similitudes to the more material thing.

To return, the term *active immunity* is applied to that form of protection which the tissues have acquired for themselves by their own self-assertion : on the other hand, those cases which have been assisted by the injection of a supplemental serum will *pro tanto* have been relieved of so much of the reactive process which otherwise would have been required of them, and their tissues will be proportionately less changed, *i.e.*, less protected. At the one end of these *assisted* cases will lie those which, in the mere presence of infection, are fortified against the threatened danger by the

injection of what is termed a protective dose of antitoxin; these cases have not contracted the infection, but the attack is anticipated in this way. Upon these cases will follow, in all grades, those in which, infection having taken place, partial assistance is conferred by a reinforcing dose of antitoxin. The term *passive immunity* is applied to that form of protection which is bestowed upon the tissues not by their own efforts, but by the altruistic labours of other tissues, as those of the ox, the sheep, the horse, or other selected animal. Of these devoted creatures may it not be said, with scansional and other apologies to Virgil:—

Sic vos non vobis antitoxificatis

—or, if speech might be granted them, might not each of these long-suffering ones exclaim (again with apologies):—

*"Hunc antitoxicum feci, habet alter lucellum."*¹

Passive immunity is of very limited duration as compared with active immunity, so that in respect of the future, and possible exposure to a recurrence of the epidemic, the organism that has been assisted is less well off than that which has received no assistance. In the use of the artificial antitoxin, however, the dangers of the epidemic in actual progress, and the uncertainties of the immediate present, outweigh problematic future

¹ "'Tis I have made this antitoxin, another reaps the benefit."

advantages, and we fly to the remedy at hand and trust in an auspicious future.

Diphtheria may stand as a type of disease in which the use of serumtherapy is upon the principle of antagonism, that is to say, is antidotal; but serumtherapy admits of quite another mode of employment. In this the toxin and not the antitoxin is the medicamentum: the remedy is now known as a *vaccine*.

In the case of small-pox, the poison, which we know to be of the nature of a germ, enters the system, and there it passes through a developmental cycle, which occasions a cycle of changes in the body of the host, which changes bring about the symptoms of the disease. The germ is not killed in its passage through the tissues, but it is modified in its virulence at the end of the attack, at least so long as it is within the tissues; after it has escaped from the body it seems to reacquire its former virulence. The proof of this modification of the virulence of the germ within the body is to be found in the facts of inoculation, which show that if some of the virus of small-pox be taken *directly* from the patient, and introduced beneath the skin of a healthy person, that person acquires small-pox, but in a milder form. That the reaction of the tissues upon the germ should modify it is not surprising—could it be otherwise? Perhaps in this particular instance it is due to some of the antitoxin clinging to the germ and introduced with it—this is mere speculation, the fact is that the virus is modified and reduced in virulence. Such virus is said to be *attenuated*.

If now the virus of small-pox be inoculated into the calf, and re-inoculated again through a succession of calves, there emerges a poison or lymph which appears to be identical with the vaccine of cow-pox. This lymph is an attenuated small-pox virus, for when inoculated it produces only a comparatively mild disorder, manifesting itself by a local affection of minor importance, with but slight attendant systemic disturbance; but the interesting point is that this mild disease is able so to change the system as to protect it against small-pox, as effectually, indeed, as an attack of the disease itself. We have yet to learn how it is that a modified virus can yield the same protection as an unmodified one, but meanwhile the facts are as above stated, and they underlie the practice of vaccination with *attenuated poisons* in order to acquire immunity. Vaccination against the liability to small-pox is the most striking instance of this practice.

It will be observed that in this form of treatment a minor ailment is inflicted in order to give protection against a major disease. To the reasonableness of this procedure in the case of small-pox the world was converted, *in the face of extreme prejudice*, in those days when small-pox, unmitigated, unmodified, dwelt in our midst.

We must now consider a third method of serum-therapy which is much employed in those cases where infection has secured a foothold within the organism, and from this point of vantage threatens not only to invade adjacent territories (local spread),

but by gaining access to the vascular systems, hæ-matic and lymphatic, to poison the whole body. The germs of disease having effected a lodgment, the one hope for the patient lies in the power of the tissues to localise the disorder, by raising up efficient barriers around the morbid focus and so isolating it. This process brings into play the protective mechanisms of the body, and it is to these mechanisms that the method addresses itself. In respect of infection, these protective mechanisms consist *on the one hand* of the active powers of the white cells of the blood (the term phagocytic action has been given to the bacteria-destroying power of the white corpuscle); *on the other hand* it consists of certain chemical agencies which devitalise the infective microbe, rendering it a more easy prey to the white cell. It is not necessary to go into detail as to the latter, the chemical agencies, for whether we call them agglutinins, bactericidal substances, bacteriolysins, or opsonins, or recognise each and all of these as varieties of anti-bacterial agencies, it suffices that the forces in question are chemical and that they are inimical to the germ.

Let us now follow the steps of an artificial infection with a toxin employed curatively: the specific toxin-bearing vaccine gains access to the tissues; there it meets with a certain natural resistance which represents the standard of health of the individual. The immediate effect of the introduction of the toxin will be a lowering of the tissue-resistance below the health level. This effect represents a yielding of the organism to

the depressing influence—it is called the *negative phase*. Upon this giving way there now follows a reactive effort on the part of the tissues: they respond to the call which the toxin makes upon them by developing an antagonistic chemical substance, the antitoxin, and as this gathers head, so the resistance of the tissues rises in exact proportion, until the standard of health is reached and even surpassed. This swing beyond the original level of health is probably a momentum effect: the term *positive phase* is given to it. A diagram may illustrate the course of events as follows:—



R R' = the normal level of tissue-resistance to a given germ.

T = the point of maximum incidence of the toxin of the germ.

N P = the negative phase.

A T = the maximum of tissue recoil measured in antitoxin; in actual site of occurrence the recoil will correspond exactly with the site of incidence of the toxin.

P P = the positive phase.

It will be clear that if during the negative phase another dose of toxin gain access, the level of R R' will be lowered still more, and that by a succession of such doses, so timed as to fall within the period of the negative phase, so great a lowering may occur that the tissues are overwhelmed. On the other hand, if a fresh dose of toxin be introduced during the positive phase, it will find the tissues in active recoil and the tissue-resistance therefore at a level

above the normal. The swing will now take place from this last level as a starting-point, and the recoil will still further raise the level of resistance : in this way, by a judicious timing of *suitable* doses of toxin, it is possible to superimpose a succession of positive phases, and for a time to raise considerably the general tissue-resistance.

Experience has to determine the suitable dose, the magnitude of which must be such that it is always far below the recoil power of the tissues, *i.e.*, their antitoxin productive power—then alone is it safely administered. The suitable dose is always a *minute* dose—minute, that is, as compared with the dose which endangers the system. The times suitable for the repetition of the doses are also determined experimentally, and recent investigation has rendered this question more determinable by certain tests which enable us to gauge the height of the resistance level, or “opsonic index,” as it is called.

The disease tuberculosis, of which the most familiar instance is pulmonary consumption, is the best example of the type of malady which is treated on these lines. In this disorder the microbe, the tubercle bacillus, has located itself in the lungs ; there, having established itself, it threatens to extend its local ravages, and, if the occasion offer, to poison the whole system. The local resistance of the tissues is the only means of keeping it within bounds, and to raise this as much as possible, and maintain the raised level, minute doses of tuberculin (an extract of the tubercle

bacillus or an emulsion of the pulverised bacilli) are from time to time injected whenever symptoms indicate and investigation shows that the opposition of the tissues is flagging, *i.e.*, that the opsonic index is low. This treatment does not in any way exclude other methods which we may possess of raising the resisting powers of the tissues to the maximum.

The treatment of tuberculous infections by means of the tuberculins is still on its trial. The theory of its usefulness is attractive and the proposal to check administration by routine determinations of the resisting powers of the tissues very scientific in its intention; but the prolonged course which the disease tends to run, and the fact that during the active progress of the affection *auto*-inoculations, due to absorption from the various foci of disease, are constantly taking place unbeknown to the bystander, set great obstacles in the way of the true estimation of the value of the method. We must therefore wait before passing definitive judgment.

These examples of the Newer Therapeutics must suffice for our purpose; to sum up, they show us—

1. The use of extractives from the organs and tissues of animals in order to supplement functional deficiencies of homologous organs and tissues in the body of the patient.

2. The use of extractives and secretions from the bodies of animals artificially deprived of a given organ in order to meet over-action of its organic homologue in the body of the patient.

3. The use of extractives from the tissues of

animals which have been successfully put through infections of various kinds and so have acquired an immunity against these infections severally. These extractives are administered antidotally, as antitoxins, both for curative and for protective purposes.

4. The use of the living germ of disease, *after it has been put through a process of "attenuation,"* for the purpose of engendering an attenuated, *i.e.*, mild, disorder; which mild disorder shall impart immunity against the graver form of illness which the unmodified germ causes. (Vaccination against small-pox is the example of this use.)

5. The use of *minute* doses of the poison of a given infection (not the living germ) in order to work up the resisting powers of the tissues to an effective level, and so to prevent both local spread and general infection (the local resistance offered by the tissues is the only means of keeping within bounds the local mischief, and the best means of preventing general infection). These injections or administrations are given upon a definite plan as to magnitude of dose and repetition.

In each one of these instances the remedy is a chemical reagent with a definite formula; this we may not doubt, even when we give the living germ itself, since this works by means of its *toxin*. There is the remedy on the shelf, and no reasonable grounds can be advanced for its separate housing and treatment; it belongs essentially to the commonalty of the *Materia Medica*. It is a great gain that the Newer Therapeutics should permit the

mind to follow the *rationale* of treatment ; therefrom we are led to hope that some day we shall be able to follow with our minds, in like manner, the workings of digitalin, of atropin, of morphine, and the thousand and one drugs the efficacy of which experience has proved.

HABIT

RIGHTLY to understand the part which habit plays in relation to medicinal treatment it is essential that we should look closely into the thing itself, Habit. What does the term signify, what imply? The word "habit" is used in one sense as the equivalent of "state of body," however brought about ; in another sense it is used to describe a state or condition which has been established by custom, and it is in this sense that the word is employed when we speak of a drug habit. The state or condition which has been built up concerns the whole man, physical, intellectual, psychic, for habit manifests itself in each and all of these spheres. Habit, thus defined, reveals itself not merely in every department of human life, not merely in the whole world of living things, but in the universe in its completeness—it is a fundamental law of Nature to which the spiritual no less than the physical world conforms ; in brief, the World is plastic unto custom and its plasticity takes the form of Habit. Thus the habit or fashion of the mountain is begotten in part of the custom of the watercourse and the glacier ; the inclination of

the tree, its habit of growth, is the outcome in part of the custom of the prevailing winds ; the piece of steel acquires polarity by exposure to the custom of the magnet ; the violin becomes attuned, polarised, in response to the custom of the vibrating strings, and it responds more readily than wood not so attuned, and so on and on in endless illustration. To custom extended in developmental series Darwin attributed an important part in the evolution of the habit of the species, in its endless variety of configuration, and he regarded this same custom as operative not merely in the diversities of outward form and colouring witnessed, but also in the psychic characteristics of the biological units.

Custom, then, what is it ? Custom is the *recurrent operation of a force*. We know that by the law of inertia a body tends to persist in its state of rest or of motion indefinitely, and that from this state it deviates only upon the entry of some new force into the field of action : when this occurs a new balance is struck, in which the new force in co-operation with those forces already in being is incorporated. Under the influence of the new resultant the state of the body swerves from its antecedent state. This swerve or bias, which, having arisen, now tends to persist so long as the new force is maintained, stands for, and is, Habit. The problem thus stated may be figured on the blackboard in simplest terms as the parallelogram of forces, but the point to be insisted upon is that the same problem obtains, the same formula for the composition of forces holds, the same law of

inertia rules, however much we multiply complexity, seeing that complexity never can take us outside of momentum, and that in the presence of momentum we are always in the presence of these two factors, and these two only, *force* multiplied into *mass*. When therefore we stand face to face with that microcosm, the human body, and bring to bear upon it some new force, we know that it will swerve in obedience to this force as inevitably as the bullet will swerve in its course, under the influence of some force newly applied.

Now a drug is such a force, or rather it is a sheaf of forces, count them virtues or vices as the case may be; and as we subject the body to the recurrent operation of these forces, *i.e.*, as we initiate the Custom of the Drug, so we develop the drug bias or habit.

Drug-custom must therefore of necessity develop drug-habit; this is inevitable, and it holds for all drugs without exception, unless we can produce a drug which is not a force-bearer, and such would be no drug at all, a *reductio ad absurdum*. But whilst this is true, it is likewise true that the most marked differences obtain with regard to the habituation of drugs; habit in the one case developing early and strongly, in the other slowly and comparatively imperceptibly. We are very far from the explanation why the tissues succumb so readily in respect of one drug, are so refractory in the case of another—for to say that it is a case of affinities is merely to repeat the statement of fact; we may, however, state this much, that it is the

potent drug which threatens with habit, and that habit is the proof of potency: as familiar instances we may mention alcohol and opium.

Into the problem of health many factors enter; let us call these factors a , b , c , d , &c., the equation standing—

$$\text{Health} = a + b + c + d, \text{ \&c.}$$

A new factor now enters the field: let us call it x ; it causes a disturbance which we call disease, the disturbance persisting so long as x persists. The new equation now stands:—

$$\text{Disease} = a + b + c + d . . . + x.$$

And now we approach with the remedy, " y ," which is selected as the best means of combating the force x . The state during the period of the treatment will therefore stand thus:—

$$\text{Therapeutic state} = a + b + c + d . . . + x + y.$$

Supposing y to be the complete negation of x , *i.e.*, to be equal to $-x$, then the ideal of treatment will have been secured and we shall have reverted to the equation of health, x and y cancelling each other. The nearest approach to such a formula will be supplied by the use of the antitoxins in the treatment of the toxæmias, and provided that we can accurately hit off the exact quantivalence of the toxin in our dosage of " y ," health will be completely restored, provided that we are able to exclude damage done to the tissues during the period of

action of the toxin " x " before its neutralisation. This damage done, which no subsequent neutralisation of the poison can undo, is of course *the* argument for the earliest possible administration of the anti-toxin. Who would delay to administer the neutralising dose of alkali to the patient in whose stomach the corrosive acid is at work? As little reason is there for delay in administering the dose of anti-toxin in a given infection, supposing its antidotal powers to be really established.

The mode of action of the antidote " y " may sometimes be *direct*, as, for instance, when acid and alkali meet and saturate each other, or as when potassium permanganate and opium meet in the stomach and the former oxidises and renders innocuous the latter: or it may be *indirect*, as when the antidote stimulates the tissues to an effective resistance to the poison; the injection of ammonia into the blood-stream in a case of snake-poison, or the massive dose of alcohol in the same state, work possibly in this way. Direct or indirect, it does not matter; in either case " y " antagonises " x ."

But the antidote, the remedy, is very rarely a pure force; it is rather, as we have said, a sheaf of forces, which we may thus represent:—

$$y = y^1 + y^2 + y^3 + y^4 \dots$$

where y is seen to be made up of primary, secondary, tertiary, and other forces. Of these it may very well be that y^1 is the only force which we want, it alone being the antagonist of " x ." In

such case we give " y " because it possesses y^1 ; but the other forces, y^2 , y^3 , y^4 , &c., we do not want, yet they are unavoidable accompaniments. Thus when we administer opium, we may want the morphia but not the codeia, narcotia, narceia, thebaia which the crude opium contains. To purify the drug and only give single active principles would seem to be the natural procedure to meet this difficulty, but unfortunately it does not remove the difficulty, for the single active principle still carries its sheaf of forces. Look through the list of the pharmacological effects of pure morphia upon the system, and its many-sided action will become apparent; it is as though its molecule were shaped with many facets and each facet presented a different kind of action.

This is a matter of considerable importance from the point of view of drug *habit*, for there can be little doubt that if the remedy could only be applied to a complete cancelling of the morbid factor, *and to a restriction to this*, habit would never arise. How should it? The formula stands:—

$$\text{Therapeutic state} = a + b + c + d \dots + x + y.$$

Ex hypothesi x and y cancel each other completely—there remain over the factors of health and these alone; the remedial force has wholly spent itself remedially, $x + y = 0$, and Nothing, though it be "elder brother even to Shade,"¹ was never yet the parent of anything.

¹ Lord Rochester's poem on "Nothing."

This is a matter of the greatest importance, and it is worth dwelling upon, viz., that remedial treatment, in its ideal form of complete antagonism with nothing left over and above of the remedial force, is perfect treatment. It represents complete restoration of the *status quo* of health, and *habit* is impossible, however long-continued the treatment, for there is no force left to incorporate itself. The nearest approach to this ideal must be the goal of curative treatment.

But as matters stand in medicine, this is not practical politics—drugs never work exact antagonism, because they never are the exact qualitative counterparts of the causes of disease, and if they were, their time incidence would never correspond exactly with the incidence of those causes, nor is there any prospect quantitatively of so exact a dosage as to leave nothing over. The result is that when we give “ y ,” we give not only y^1 , which we do want, but also y^2 , y^3 , y^4 , &c., which we do not want, and these accompaniments, together with any excess of y^1 over and above the needful, make their impression on the body; with recurrence of the dosage these redundant factors build up a habit; it is these we miss should the custom of the drug be interrupted, and the more so the more their superabundance is actually pleasing, for they have become *momenta grata* to the system. It amounts, then, to this: that whilst we might and should take a drug because it cancelled *disease* in any form, we love it, fly to it and become its slave, not for its powers of negation,

but because of the positive benefits it bestows, the gifts it brings with open hands. Opium relieves pain ; true, and in this respect alone its beneficence is incalculable. But unfortunately opium also stimulates, excites, and may bring about a most delightful state of euphoria. A full dose of alcohol may quickly remove a neuralgia, an internal distress, a depression, but at the same time it also may confer a light-heartedness gladly possessed. Cocaine is magical at times in the rapidity with which it eases, but, again, there is the accompanying sense of well-being, which is not the result of mere negation, but is unmistakably positive. "*Timeo Danaos et dona ferentes*"; here the medica-menta are the Greeks, and we fear them, not *though* they bring gifts, but *because* they bring gifts, and this fear shall be quick within us when, either in our own persons or in the persons of others, we realise that the remedy is sought, not solely because it relieves ; is not waited for until relief is called for by the symptom ; but is sought for its own sake and impatiently.

A characteristic of drug habituation is the tendency of the effective dose to grow. This is so familiar to us that in general we do not stay to inquire how it comes to pass that the same dose—the same quantity of force, that is—produces less and less effect. How should this be possible ? If we turn to simpler things—and complexity must always get its sanction from simplicity—we find that the same phenomenon is witnessed ; thus if we investigate the laws which govern the fall of a body

down an inclined plane, we note that the weight W , which slides down the incline $A B$, expends, in so doing, part of the momentum which it should acquire in falling from A to C , in overcoming the surface friction between itself and the plane ; so that the energy possessed by it on reaching B would be represented by the total energy or momentum due to the fall from A to B (*i.e.*, from A to C), less the energy dissipated as heat and otherwise which the friction had occasioned. Let the fall be repeated again and again, and gradually the rubbing surfaces of weight and plane will grow more and more smooth, the co-efficient of friction will



pari passu grow less and less, and the momentum possessed by W as it reaches B will each time grow more and more ; therefore, theoretically, the surfaces being perfectly smooth, there will be no friction at all, and the momentum possessed on reaching B will be exactly the same as if the weight had fallen directly from A to C . In the language of the physicist the falling weight has done work upon the contact surfaces of weight and plane, and each expenditure has left a lessened task to perform, *i.e.*, less of resistance to overcome.

Let us now consider the problem of a drug, alias a force, applied to the living tissues ; this force

spends itself upon these tissues, overcoming their resistance and conferring upon them a certain polarity. The nervous system is the best example of the kind: we know in this case that external stimuli are brought to bear upon nerve endings, travel along nerve fibres to nerve centres, and then, centrally, work their way along paths of least resistance to reach points of emergence into efferent fibres, along which they now descend to peripheral end-organs; we know that as this is done the resistance of the long journey is gradually overcome, and that when the drug is finally cast out of the system it is more or less empty of that energy which it possessed on entering the system. As this act is repeated again and again, so the resistance to be overcome grows less and less, the force slipping through the nervous system with greater and greater ease; hence, by the time it has reached its journey's end and is leaving the body, either it will be comparatively unspent, its energy unutilised, or, if spent, then the spending will have been in other directions than in mere pioneer work. After this fashion the nervous system and all other systems react to, and are organised by, a given force—in this instance a given drug.

But, as we have seen, consciousness is stirred in proportion to the obstruction overcome on the way. The child learning the piano is conscious unto tears of the hardness of the ways of music; the accomplished pianist, on the other hand, is so little aware of any effort, as his fingers follow the familiar passage, that his mind is able to pursue a wholly

independent train of thought. In like manner the first dose of a drug which stimulates consciousness is very much in evidence, but as the doses are repeated, and the paths of travel become more worn, the percentage of the dose of energy which figures in consciousness falls in equal measure. Let us suppose now that sentience is agreeably stirred by the drug in question ; then, since each dose yields a smaller percentage of pleasure, in order to procure a renewal of those first delights experienced, the dose must rise in inverse proportion to the frequency of recurrence. To put the matter in the nutshell of a formula, let—

P stand for pleasure.

D „ „ the magnitude of the dose of the drug.

F „ „ the frequency of repetition.

Then—

$$P = \frac{D}{F},$$

i.e., the pleasure is directly as the size of the dose and inversely as the frequency of repetition.

The dose of opium recognised as safe by the Pharmacopœia stands at 5–30 drops of laudanum for the adult ; but so faint is the praise which the system accords to this famous arcanum of Paracelsus,¹ once the opium habit has been well established, that according to De Quincey 8,000 drops may be required to stay the craving for the

¹ The word “laudanum” is derived, according to O. Croll, from *laudare*, “to praise.” See Berendes, *op. cit.*, p. 123.

drug ;¹ to such a degree does custom dull the gloss of pleasure. In order to make up for this detraction, custom appears as a real benefactor, when, in the formula above stated, P stands for pain, for now each repetition of the insult takes from the poignancy of its reproach, and thus the formula

$$P = \frac{D}{F}$$

covers the whole field of sentience, pleasurable or painful, and expounds to us the law according to which the edge of pleasure or of pain is blunted by habit.

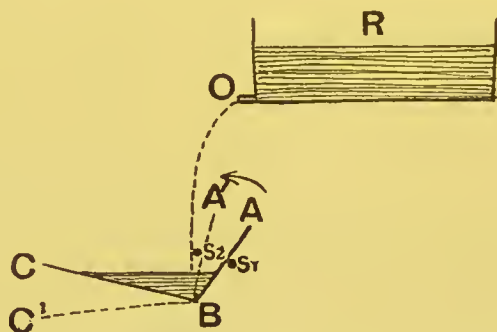
We have next to examine a phenomenon which at first sight seems to be at variance with the one which we have even now been considering, viz., the tendency of the effective dose to grow through custom. The new phenomenon exhibits a force lending itself to the system for a time, after the manner of a crutch, upon which for a while the body leans, but less and less as time goes on, until, eventually, the crutch is cast aside. How may this be? how reconcile such working with the foregoing argument? and can we, within the simplicity of physics, discover any parallel manifestation? Yes, we can, nor have we far to seek : it is quite easy to contrive an apparatus, such that it shall convert a constant stream of inflowing force into an intermittent series of outflowings.

In the *empty state* of the trough the arm A B is so

¹ See Cushny, "Text-book of Pharmacology and Therapeutics," ed. ii, p. 220.

weighted as to maintain the trough in the position $A B C$, and if tilted into the position $A' B C'$, to carry the trough back into the position $A B C$.

If the process be now started with the trough in the position $A B C$, then as it gradually fills with the drip from the reservoir a point will be reached when the weight of the water acting upon the long arm of the lever $B C$ outbalances the arm $A B$ —the trough tilts forwards into the position $A' B C'$ and is emptied. The weighted arm $A B$ now restores the



R = a reservoir, the mean level of which is a constant.

O = a point of outflow, whence will issue a constant stream.

$A B C$ = a trough receiving the outflow ; it is capable of movement about the point B in the direction of the arrow and between the stops S_1 S_2 .

empty trough to the position $A B C$ and the process is repeated indefinitely in rhythmic series.

Within the body we are presented with numerous instances of rhythmic action, notably in the circulatory (cardiac) and respiratory workings, but also in many others: witness the periodicities of action of certain of the excretory organs, intestinal tract, and urinary apparatus; and there can be little doubt that these periodicities are brought about by contrivances whereby stimuli, more or less constantly

supplied, gather, until a certain tension-level is reached beyond which equilibrium cannot be maintained. When this is overstepped, discharge takes place, then reversion to the *status quo*, then reaccumulation unto a fresh discharge, and so on indefinitely. It is, of course, not pretended that there is any gross similarity between the *modus operandi* of physiological rhythmic functions and the above rudimentary physical *schema*; the similarity will exist only in the fundamental postulates of a constant supply of stimuli, a contrivance of *some sort* for storing these, and a tension-level which represents the discharge-point: given such, then the data are given for an automatic rhythmic function.

To revert to the *schema*, let us suppose that owing to some rusting of the hinge at B the apparatus refuses to work, the water accumulating as usual in the trough, but the resistance at B preventing the discharge-level from being effective; overflow will then follow, but no automatic emptying. Let us now, each time the discharge-level is reached, throw in a force more than sufficient to overcome the resistance at B; we shall then restore the discharge periodicity; but each time we throw in this extraneous dose of force we shall *wear down the resistance* at B, and in time we may expect a restoration of the smooth surface of the original working apparatus; and thus, each dose of the remedy encountering a lessened resistance, it will be possible to reduce the dosage until in the end medication can be dispensed with altogether.

And now in the body, without postulating actual rust, we may suppose some hindrance to an automatic function which will be of the nature of a resistance, and that the drug, by *spending its force upon this resistance*, will gradually break this down, restoring the *status quo ante*, and, through a series of lessening doses, leading up to a discontinuance of the medication. As a matter of fact we do find that medicines can be used, in falling dose, to the restoration of a function, and ultimately may be set aside; and as a matter of theory we see that this is quite comprehensible and in keeping with observations among a simpler order of phenomena, viz., the physical.

Reverting again for a moment to the *schema*, we may point out that to restore an automatic function it is not necessary in every case to introduce a new force—a new factor there must be, but it may be of the nature of a something which conditions favourably, rather than coerces: for example, if, instead of wearing down the resistance of the rusty hinge by the supply of an additional turning force, we add some lubricant, we may so reduce friction that the ordinary forces in operation shall be effective, and the automatic function will then reappear. In this case, as in the case of the supply of a force, we shall note that the dose of the lubricant required for the purpose will become less and less as the turnings reproduce the original smoothness of the hinge. Conceivably, then, the medicament may be of a similar conditioning nature, but the point to be insisted on is that, granting this,

the effective dose will be a lessening one, and eventually will be so reduced that it may be discontinued. Medicines thus employed, far from establishing a drug habit, *re-establish a habit of body*, viz., that rhythmic function which, belonging to health, has been in default.

Whilst, however, we shall recognise that, judiciously managed, the course of treatment may do all this, we shall, as wise men and women, keep our eyes open to the fact that the course of treatment may be a real source of danger, and the more so, the more obstinate the symptom to be overcome, and the more so again, the more a drug confers favours outside those needed to combat the symptom in question. It is here precisely that judgment comes in, for unless we realise that the remedy is a two-edged sword we shall never wield it safely—*remedium*, yes, but *remedium anceps*: no better case in illustration can be adduced than the use and *abuse* of the soporific.

It is, however, in those cases in which the recurrent disorder presents no periodic tendency, that the recurrent use of the remedy brings the greatest peril. The disorder is renewed, we assume, but its renewal is fitful and seemingly at random; and whilst this recurrence calls for a repetition of the remedy, the administration is upon no plan, owns no time restrictions. Thus, whilst the administration of the soporific awaits the hour of sleep, the anodyne remedy which an irresponsible pain demands, both in and out of

season, acquires a greater hold upon the system through its very lawlessness: this, of course, holds only if the recurrence of the symptom is frequent, but then it is in direct proportion to the frequency.

Such are some of the more important considerations respecting habit in general, and the drug habit in particular, but the word "habit" looms so very large in the minds of many, clothes so dire a personality, that it is well to ask whether the drug habit is *necessarily* an evil. The answer to this question will depend very much upon our understanding of the term, but used now in the sense of a *dependence acquired*, that answer must be unquestionably No. Let us return once more to the case of the disease myxœdema, which involves a widespread degeneration of the tissues with a general lowering of the functional activity of the body dependent upon a secretory failure of the thyroid gland. The remedy for this affection we have shown to be an extractive obtained from the healthy thyroid gland of certain animals. Now, having secured the full benefit which a course of this drug is able to confer, it has been found by experience that the best results are obtained by reverting to the administration of the thyroid extract at stated intervals—in this way the drug effect is maintained. The thyroid habit may thus be said to be established, but it is clearly not only warrantable, but imperative in the interests of the patient. The organism has been wont to

rely upon the habitual presence of its own thyroid extractive ; this makes default, and you borrow elsewhere the necessary extractive, and continue the supply at intervals and in doses which you find to be most serviceable : the practice is as common sense as the habit of a food supply, but, none the less, thyroid extract is a drug. The conclusion is inevitable, the continued administration of a drug may be a beneficent habit.

After all, Habit is not to be escaped ; our up-risings and down-lyings are matters of habit, we live and move and have our being by and through habit, and the crux of the matter will be found to lie rather in its relation to the welfare of the economy : if this relation be harmful the habit is evil, if beneficent it is good : tried by this measure it is certain that we must acknowledge that the drug habit may be amongst the last-named.

CONTROL

I NASMUCH as the passage of any and every force leaves a more open pathway for its successor, and this by a law traceable deep down into the nature of things, are we to conclude therefrom that the organism is at the mercy of every stray force which the hazard of life brings its way, provided the recurrence be sufficiently oft repeated? The door having once opened, must it open again and again to the tap or rap of the visitor, with a free and freer swing according to the importunity of the visitant? We see here the terms of a slavery not pleasant to contemplate.

But is this really so—is there no way of escape? Fortunately for us there is, and we must now turn to consider certain protective measures which the body is able to call upon to safeguard itself against this threatened tyranny of Custom. The instrument, if so we may call it, provided to this end is named Control. The conception conveyed by this name is almost primary, and it is difficult, therefore, to define it further without risking the reproach of tautology; nevertheless the attempt must be made. We are to understand by “Control” the power, at

will, to throw a resistance into the pathway of a force—the power, that is, to inhibit, to deny a right of way.

Now the body is, as we know, a field of operation to Force. This, like the “Great Adventurer,” having come, “will find out the way”: the paths along which it travels through the tissues cross and recross each other, presenting us with a system of intersecting lines, intricate to a degree, which lines correspond to channels of greater and of less permeability. Compared with this system the labyrinth constructed by Dædalus was as nothing. To give but two examples, let us look on the one hand at the canalisation of the body for the blood-stream:—its main trunks; its branchings, primary, secondary, tertiary, and so forth; its infinitude of inosculations: then let us turn and look at the central nervous structures with their endless ranks of cells and cell clusters; the branchings of these cells and the finer ramifications of the branchings, whereby an intercommunicating network is established in which Ariadne herself must infallibly have gone astray. Into this maze Force enters, and without pause, never for one moment in hesitation, it pursues its course unerringly. Its track may appear devious in the extreme, yet in fact is simplicity itself, since it follows the one only path open to it, viz., the path of least resistance. Force in its recurrence, *i.e.*, Custom, now sets to work, smoothing this path, broadening that, opening up new lines of communication and so facilitating the means of transit. Technically this work

is termed organising, and a circuit or district in the brain or spinal cord thus organised becomes a centre for the ready reception and transmission of that force, or group of forces, which has worked, *i.e.*, organised the district; this force or group of forces has acquired, so to speak, the liberty, the freedom of that centre. Let us endeavour to view the matter in the concrete.

Let A and B stand for two brain cells which have certain established structural relationships represented by the branchings marked 1 and 1 and

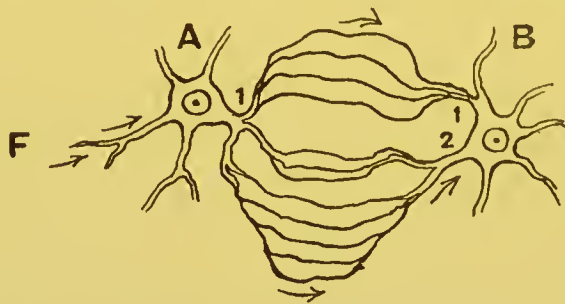


FIG. 1.

Stage of commencing organisation.

2. A given force F now enters the field; arriving at A, it works its way across the ramifications of 1, and reaching the branchings 1 and 2 of B, by way of the finer ramifications indicated, it arrives at B. The stimulation of the cell A by the force F, whatever form this may take, is thus communicated to the cell B, and a functional relation instituted.

Multiply now the frequency of access of the force F, *i.e.*, its Custom, and in exact proportion to this frequency, the resistance offered to the passage of the force from A to B is overcome and the

freedom of transit rendered easy ; in other words, the functional relationship of the cells A and B is rendered closer. This later stage may be represented by the cells A' and B', the dark broad lines of the intercommunicating branchings in Fig. 2 indicating their increased permeability.

These figures are to be regarded as schematic only, and as intended to represent the bare essentials of nerve cell connection : Fig. 1 in the early stage, when organisation is beginning, Fig. 2 in the late stage, when organisation is far advanced.

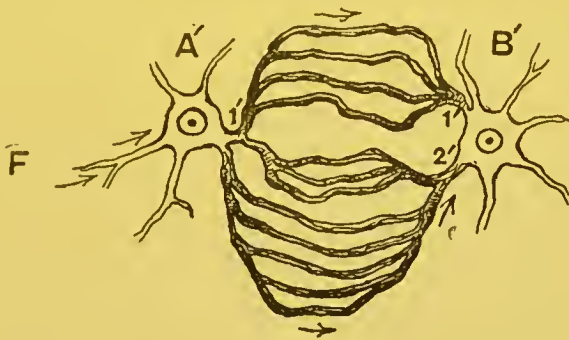


FIG. 2.

Stage of advanced organisation—Habit.

The diagrams will hold equally whether we allow A and B to stand as single cells or replace them by cell clusters ; whether the intercommunication be as simple as above shown or complicated by one or more interpolations of groups of cells : the sole point which it is intended to illustrate being the breaking down of resistance by the recurrent action of force. And Fig. 2, what is it ? Habit—no more, no less, and delineated *ad verum* if not *ad vivum*.

Into the field which Custom has laboured after

the manner described, Control now makes entry, and, upon the pronouncement of the Will, throws into the channels of easy flow a resistance of greater or less magnitude. The result is immediate: it is as though the cell ramifications, having relaxed under the frequent passage of the stimulus, now contracted themselves in response to this new impulse which the Will has sent forth; at any rate this is the effect, whatever the actual mechanism, for we find that the channels of conduction have reverted to their former relatively impervious state.

Here is a matter of primary importance in so far as the physical and moral welfare of the individual is concerned, viz., the effectiveness of the will power to control. The change from the state represented by Fig. 1 to that shown in Fig. 2 is absolutely unavoidable if force have a sufficient custom—there is no way out of this; but, despite this change, it is still well with the individual if behind the scenes there is an effective power, which at need can be called in, and must be called in, to bar the way to custom. Thus we must recognise the essential division into Habit *controllable* and Habit *uncontrollable*.

As an example of the power of the will to resist the most imperious calls of the body, one may instance the incident recorded by the traveller Sven Hedin: when, after hardships almost indescribable, he had crept out of the desert which he had been traversing, one of a few survivors, and, more dead than alive, saw before him the living water, what was his first act, not his first impulse? A

traveller schooled by long training to the great task he had undertaken in the interests of science, first he counted his pulse, then he drank.

As an example of Habit long established and of great insistence, but still under partial control, I may give the case of a man of considerable mental powers who, by reason of an insomnia, had acquired the chloral habit, and in this had risen in his dosage to quantities which were far over the borders of the poisonous. Every other night the servants would carry up the lights into the bedroom, and the hours would be passed in reading, whilst on the alternate nights sleep would be secured by a huge dose of chloral. This man lived to advanced years, and the above relation was obtained from the son, who recalled the circumstances from childhood.

Of habit uncontrolled we each of us have but too many examples within recollection, but the following instance is among the most striking: a woman had become the victim of a camphor habit, against which she had struggled often, but in vain; on one occasion, standing near the window, a piece of camphor in her hand, and the moral conflict raging within, she finally by a great effort cast the camphor from her through the open window. The piece struck against an outside bar and rolled back into the room; this was too much for the will-power, which, having made the supreme endeavour, was relaxed and off its guard—habit once more gained the day.

What, then, is this will-power, this power of

choice? Where does it reside, and by what structural mechanism does it inhibit the natural play of forces within the tissues? To those who deny the fact of a free will—and the word “will” has no sense except as a free agency—these questions can have no meaning; for them the Will is not. How such men will approach a case of a habit which is working disaster I am unable to conceive, and the questions must be for those only—by great good fortune the vast majority of the race—who accept an assured and primary consciousness as of more value than many arguments. Pascal’s words, “The heart hath reasons whereof the understanding knoweth not,” come from one of whom Stanley Jevons, the logician and economist, has said: “It may be doubted whether any man ever possessed a more acute and perfect intellect.” But if these words of Pascal’s are true, then, without stretching their meaning, we may say, there are reasons of which the understanding knoweth not—reasons, that is, which appeal conclusively to some part of the ego other than the understanding. Of such kind are the reasons which assure the ego that it possesses a free will. Given its existence, what is its nature? We do not know; we can only define it in terms of its selective, elective prerogative. And its dwelling-place within the body? Again we do not know; neither do we know by what mechanism it operates.

Whilst, however, we are ignorant of so much concerning this great power, we know some circumstances which attend upon or condition its

efficient operation. For instance, we know that the law of growth holds for it; that in order to become more effective it must become dynamic, must be exercised; that unused it becomes atrophic and dwindles. It is possible, and perhaps probable, that this law of growth applies to the structural mechanism through which the will operates, whatever this may be, the instrument becoming more perfect as the will is more often applied; for it is certain that a force cannot be counteracted save by another force in opposite phase, and that a resistance cannot be thrown into a circuit save by means of a force adequate thereto; consequently that the will in operation within a material body can only work in obedience to physical laws. We must therefore take it that the will-power, when it steps into the arena, makes use of the stores of energy which it finds to hand, and directs this energy into this or that channel at discretion, and that from this point of view it has a material, or physical aspect.

Of all the qualities which go to the making of the ego, admittedly the most momentous is that which we name character—momentous because it stands for the momentum of the personality, and according as this momentum is projected into the world, so, for good or for evil, that personality takes effect. Now, character manifests itself through the will-power, which is indeed its essential, distinctive feature. No involuntary act has ever stood for aught in the spiritual world. In the Garden of Eden morality had no existence until the pro-

hibited fruit of the tree of knowledge glowed through the leaves and through the prohibition, and Desire lifted its serpent-head and hissed its temptation, and within the breast of the man and the woman the God-implanted free gift, freedom of will, stirred and made choice. Then it was that automatism ceased; then, and not till then, Good and Evil walked the earth.

Into the intimate nature of the Will it is improbable that we shall ever look; content rather must we be to class it amongst the Unknowables. But it is something if we recognise that in its application it presents a physical aspect; that in certain respects it does conform to the law of physical growth, and that to this extent we become responsible for its development. This responsibility grows in stature as we realise that the choice that is ours lies between good and evil—fortunately for us these bear the likeness of our intent, and have nothing whatever to do with felicities or infelicities of judgment, nor with the sequences which actually unroll themselves before us.

In the treatment of disease a first principle is that, if sacrifice there must be, the less noble function must give way to the more noble, and this in the interest of the common weal. The principle is so frankly utilitarian, and from this point of view so self-evident, that it needs no elaboration; if life is at stake, then any and every organic function must be unhesitatingly sacrificed, if by so doing the prospects of a prolongation of systemic life are improved; upon this principle

Medicine and Surgery proceed daily, hourly. The principle is broader than the healing art: it rules in every department of life unchallenged—the less noble must yield to the more noble. But when we come to consider the spiritual side of man difficulties arise as to what is the more noble, and how we shall weigh the spiritual against the material, and whether we are to accept the principle of Life at any cost. These questions press; for supposing that in our procedure of the sacrifice of the lower function for the higher, we make out our list of the organs and condemn each in turn—leg, arm and hand, the kidney, spleen, stomach, the lung even—pruning unsparingly in the interests of the major part; supposing that we come finally to the cerebrum itself and are led to the conclusion that systemic life might be prolonged by a sacrifice of the higher cerebral centres, not of one or two, but of so large a number that there could be no hope of a rehabilitation, no room for the re-education of fresh centres—should we accept the principle then? Would there be two opinions that such a Frankenstein, such an anencephalous monster, the hand of man has no right to create? Apply the principle further. Let us leave those higher centres which preside over the intellect, let us leave the capacities for art, literature, science, asking only that the will-power, the character, shall be offered up in order that this precious Life may be kept—what now will be the answer? There can be only one answer for those who hold that the most treasured possession of all is character—that nothing

can weigh against it, that it must stand before all. This answer is, that no treatment can be defended which leads up to a moral degradation. The purpose of life is the development of character; this is precisely where the responsibility of each of us comes in—in particular the responsibility of the healer—and just here it is that the question of Habit arises.

It is not practicable to lay down rules hard and fast which shall determine our practice in this matter—the essential is that we shall approach the question in the right frame of mind, the principle clearly in view, that the nobler must not give place to the less noble. This established, then individual considerations must decide the course of action: to bring the ready comfort of the drug to remedy, here a sleeplessness, there the harassment of pain, this may be safe and wise practice in the case of the strong-willed man who through life has kept himself in hand; but in the case of the infirm of purpose, who has ever run before the gale of circumstances, such practice will have to be hedged round with the most stringent precautions, or the remedy itself will become another circumstance unto further infirmity. We witness each day the most striking differences in the control of the individual over himself. Here is one who puts no restraint upon himself, and seems bent on riding for a fall; his habit, say for tobacco, is such that it monopolises his waking hours; suddenly this man breaks absolutely with his custom, and, strangely, he may tell us that he does this with little or no difficulty. The period

of total abstinence is continued for a certain time, and then is replaced by another period of unrestrained licence. This is quite a different state of things from that of the alcoholic, who may break down entirely in the course of his excess, and then and subsequently may for a while lose all desire for drink. The break above referred to occurs in the midst of perfect seeming health, and is the result of a deliberate effort of will, in revolt against a threatened tyranny ; the character of this individual is probably a strong one, its strength maintained by these recurrent breakings of the fetters of custom. It is, however, a less strong character than that of the man who rides custom on the rein and can enjoy in moderation ; certainly it occupies a less secure seat, for the wise man will ever act upon the assumption that there is no strength of will which the force of unrestrained custom may not outrun. Custom in its early stage has no momentum behind it, and it is best to keep it so ; for though we may have fullest confidence in the stores of resistance at the disposal of the will, also in the working order of the machinery for throwing in the resistance, yet it is not safe to let momentum gather head, seeing that we may have miscalculated ; moreover, there is always the question of wear and tear to be considered, and the sudden arrest of a great momentum cannot be achieved without a great deal of internal friction.

Each case, then, will have to be considered upon its merits, and these merits will include not only the individual personality, but the position of this

personality on the chart of life, outward or home-ward bound, the career in prospect or in retrospect. To regard the question of Habit and Control alike, now when Life touches its zenith, and now when it is within sight of harbour, is not to follow the dictates of reason. Sometimes in the midst of seeming health, in the full tide of things, the warning comes that we must make ready for departure, as when a cancer declares itself; and not to take into account this new fact and make due allowance, is to prove ourselves unskilful mariners. Habit is not to be made into a bogey, neither is Control to be made into a fetich. Life always will run betwixt its Scylla and Charybdis: it is meant so to run, that is why the helm is put into our hands to guide. It is meant that we should have the opportunities to show ourselves courageous and prudent steersmen, but these opportunities the great waters only can give. If for fear of establishing a habit through misuse we forgo the benefits which are here to our hand for use, we shall inevitably limit the scope of life, and so narrow its outlook and cramp its purpose.

CHARACTERISTICS OF THE UNCONTROLLED HABIT

THIS subject must be regarded from a two-fold point of view—the general and the special. Each habit which has outgrown control presents certain features which it possesses in common with its fellows, and which characterise loss of control as such ; in addition, however, it presents other features which are particular for the particular habit—after this manner generically and specifically, habit declares itself.

The general characteristics of loss of control call for first consideration ; they may be conveniently classified as moral, mental, and physical, in this order. Thus the victim of a pronounced habit will exhibit early the marks of a moral decadence ; upon this the evidence of a mental failure will be likely to show itself ; and then, more or less strikingly, a physical decay will set in. The organism in its totality will in this way become deteriorate, but the point upon which special stress must be laid is that failure appears first in those higher faculties called moral, which together make up that which we designate as character. We shall observe, for

example, that the man, the subject of a rooted vice, has lost that keen interest in life which belongs to health,—this loss marks a blunting of the faculties ; that whereas in the past he had been quick to apprehend and pass judgment, now he is indifferent ; that whilst he was wont to be sensitive to the opinions and comments of others, and anxious that the respect in which he held himself should be shared by them also—this no longer concerns him. We had looked upon him as essentially truthful, reliable, scrupulous, but it has become impossible to place credence in his word or confidence in his actions, and his scruples have vanished with his principles. He was a man of endeavour, pains-taking, capable of sustained effort, equal to the emergency—now he is purposeless, impatient of detail, fickle and wholly unfit to cope with that which the occasion may bring. Lastly, we miss in him those niceties of dress and person, of manner and bearing, which had been his. This man may still be able to reason acutely and draw the correct conclusion, but he will not trouble to pursue his conclusions from their vantage-ground because he has lost interest in the mental chase. Sooner or later the powers of the mind will begin to show a more obvious decline ; failure of memory will creep in, a failure in excess of mere want of effort, and thenceforth the gradient of intellectual descent will continue to decline.

As the higher powers fail, so the physical powers tend to flag, and in this likeness, degeneracy, moral, mental, and physical, stands or slouches

before us. Such is Habit, incorporate yet impersonal; for this is the fashion not of one man but of a whole tribe.

It has been said that the subject of habit is characterised by a lack of interest in, and indifference towards, the things of life in general; and this is true with one exception, the man's own habit—this interests him intensely, around this his being revolves. Even here, however, we do not observe an active pursuit such as a legitimate object might claim. What we do see is an insensate race in which the man's desires drag him captive at their heels, or to which torments of mind or body goad him as the Furies goaded Orestes. To compass his longings, to escape his distresses, this man will put forth all that he possesses of physical force, of mental acuteness, of moral obliquity, and for the time being, when habit is at its height, this self-centring makes him the embodiment of selfishness. If we would doubt this, let us look at the dipsomaniac, or the victim of the morphia habit, at the top of his mad bent, for it is a veritable madness that we behold.

How, we may ask, has this man lapsed from his high estate so arduously attained? The answer comes:—by no freak, by no chance happenings, but by a law well recognised, the law of dissolution. According to this law, when decay or retrogression makes its appearance in the human body, those functions suffer first which are the most elaborate in their complexity, and the most recent in date of organisation: we shall not be surprised at this,

seeing that these functions must, on both counts, be least stable. In the process of structural and functional development of the tissues, the first functions to be established are those fundamental ones upon which organic life depends,—the circulatory and respiratory workings are of this kind. As development progresses and reaches higher planes, the education of the intelligence and of the moral sense should proceed together, but we must take it that the biological article in its most finished state, the educated man, shows us in the moral faculties, in the psyche, co-ordinations which are both more complex and which occupy a higher plane than the intellectual co-ordinations. It is of these that Spencer is speaking when he says: "The plexuses, which, by connecting and co-ordinating a variety of inferior plexuses, adapt the behaviour to a variety of external requirements, have been but recently evolved, so that, besides being extensive and intricate, they are formed of much less permeable channels."¹ These channels, less permeable because less travelled, will be the first to suffer when degeneration sets in; in these channels the higher feelings move.

There is some dispute still on the subject of moral insanity, but, as Dr. Hack Tuke says, this is largely a question of terminology and definition, and the recognition of the case of moral insanity as a clinical fact will probably be allowed universally,

¹ "Principles of Psychology," vol. i, p. 605. See article on Moral Insanity, by Dr. Hack Tuke, "Dictionary of Psychological Medicine," vol. ii, p. 815.

though its naming may be debated. Employing the term as Dr. Tuke defines it,¹ we cannot avoid the conclusion that Habit as an instance of lapsed control is a form of moral insanity. Into the question of accountability we need not enter; the disease is apparently acquired, but the quality of the nervous tissue, its stability or instability, will be all-important in the resistance offered to temptation, and clearly heredity comes in here. Practical sociology must be more or less blind to this aspect of the subject, viz., the part played by inheritance, and in the main must hold the victim of habit responsible for his own degeneracy.

Before leaving the psychical aspect of Habit, one element in the moral bankruptcy is perhaps deserving of special regard, viz., the loss of self-respect, which is so central a feature in the disease. The man who has begun the downward path by first breaking faith with himself, willing not to do this thing and then doing it, ultimately reaches the point of breaking faith with others, pledging his faith to them and then failing to redeem his pledge—a far more serious breach. When this stage has been reached vice will have become so at home by its frequent visitings, that the central pathways will be thoroughfares to all impulses approaching the particular area at fault. With the loss of self-reliance a sense of helplessness and hopelessness is apt to supervene, against which it is hard fighting, and to meet which it is almost certain that outside help will be required. The importance of

¹ *Op. cit.*, p. 814.

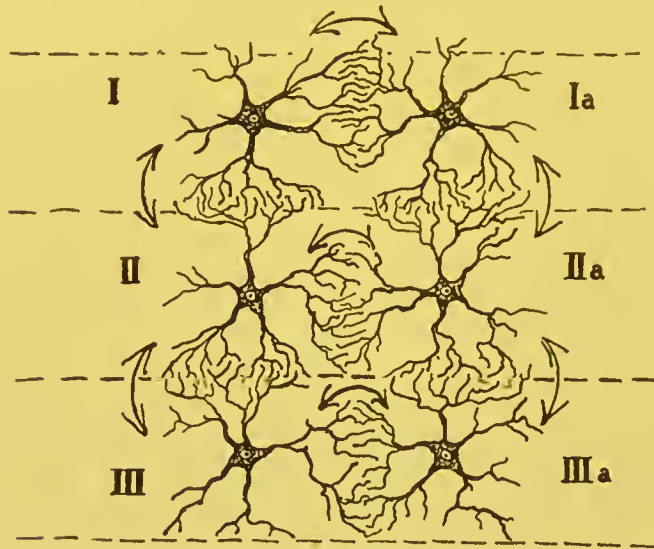
this matter lies in the treatment of the case, which must ever keep in view the central defect, and aim at the resuscitation of that self-confidence which, rightly held, is so admirable. Loss of control by the higher co-ordinations involves, of necessity, disturbance among the lower co-ordinations down even to the lowest planes of physical life, for the house of man is not built upon the principle of the house of bricks. In the latter the happenings in the top storeys are no necessary concern of that which is going on in the basement, and *vice versa*; not so in the human body, here an essential interdependence characterises life on every plane. In the workings of the mind as distinguished from the feelings, the latter count for much—for instance, as desire, ambition, purpose, sense of duty, egoistic or altruistic; and though in certain directions there does appear to be a tendency for the intellectual and the emotional to conflict, the development of the one being adverse to the growth of the other, yet upon the whole we must recognise that the higher levels of feeling are inextricably associated with the higher levels of thought. To such an extent is this the case that it may safely be said that the mind cannot find its highest expression without these psychical incentives. Loss in the higher psychical co-ordinations is therefore always attended by loss in the higher mental co-ordinations.

The same is true, though the evidence thereof may delay, when we come to consider the physical co-ordinations. In proof of this we need only point to the value of *moral*: let us look at the achieve-

ments of an army with a Gustavus Adolphus at its head, or of a navy with a Nelson in command, and compare the output in mere physical energy, as measured by the fatigues and hardships undergone, with the output of like companies of men lacking commanders of equivalent personality. This truth has of late received interesting confirmation in the results of the sanatorium treatment of consumptives. Physical labour, purposeful, productive, has in recent years been introduced as part of the routine treatment of the institution, and the superintendents are able to point to an improvement in bodily health, attendant upon the improved *moral*, which itself follows so soon as mere loafing is exchanged for productive labour. Admittedly there is a difficulty here in determining which takes precedence, the physical or the psychical—and there are some who are inclined to give the priority to the physical change;¹ but with the facts before us, that the productive powers of the soldier stand in direct relation to the confidence reposed by him in his captain, and are sequential, it is more than probable that, in the case of the patient, earnest in his desire to return to work, the commencement of a scale of productive labour, which promises to lead up to this, will give a confidence and add a hope which, growing with each step of progress achieved, must make powerfully for health. Need it be said that in the realisation of this, the personality of the head of the sanatorium will count for no

¹ "Graduated Labour in Pulmonary Tuberculosis," Dr. M. S. Paterson, *Lancet*, January 25, 1908.

less than that of the leader in every other concern of life, be it militant, educational, or commercial ; nay, it should count for more, seeing that the sick, being less self-reliant, are more dependent on others.



SCHEMATIC REPRESENTATION OF NERVE CENTRE RELATIONSHIPS.

I, II, III are three centres—higher, middle, and lower—in order of succession ; II subordinate to I, III to II.

I^a , II^a , III^a represent a similar sequence, in which I^a is co-ordinate with I, II^a with II, III^a with III.

The arrows indicate that both in co-ordination as in subordination there is action and reaction across the connecting plexuses.

Normally this interaction will have a mean value, which will stand for the equilibrium of health, and in this equilibrium these three planes of co-ordination and subordination will make one whole. Into this field of forces, in touch and at balance, any new force entering must disturb the equilibrium of the whole, and lead to a rearrangement throughout the entire field. If now the upper plane represent a psychological, the middle plane a mental, and the lower plane a physical nexus, it will be apparent how Habit as a disturbance in plane I, I^a , must make itself felt in the middle and lower planes.

We must now pass on to consider those more specific spoilings which specific habits bring about, for hitherto we have dealt with the matter in the general, and the failure on the physical plane, in

so far as it has been the result of a want of control exerted by the psychological plane, will have been of the nature of a general loss of tone, such as a muscular inelasticity, a less ready nervous discharge, a sluggish circulation, a want of respiratory vigour, and a lazy metabolism, rather than a definite morbid set or drift: the like is true of the intellectual failure witnessed. The definite morbid bias caused by the particular drug habit must therefore be dealt with now; but habit is so universal, and in respect of drugs belongs to so many, that to attempt to give a complete list of habits would be wearisome in the extreme, and quite purposeless from our point of view; we must therefore be content to select a few illustrative types.

Brouardel has said, "on entre dans le morphinisme par la douleur et on devient morphinomane par volupté."¹ This specific statement expresses a general truth, viz., the twofold mode of origin of drug habit, for it is applicable either singly or jointly to every drug. We fly to drugs and we initiate habit, either to escape a distress of mind or of body, or to secure a pleasure, or to compass both objectives—need we say that the drugs which present these gifts in either hand are the most to be feared? From the point of view of habit, drugs are to be suspected and treated as enemies, and the more gifted the drug the more must it be allowed with misgiving—on the principle of the Virgilian line, applicable to all "Bringers of Gifts."

¹ "Opium, Morphine et Cocaine," P. Brouardel (Baillière et Fils, 1906), p. 54.

Two great classes of drugs furnish us with the most striking instances of habituation, viz., the Sedatives and the Stimulants. Under the heading Sedatives we must group all those drugs which allay a discomfort ; here come the *soporifics*, chloral, sulphonal, paraldehyde, veronal, &c. ; here the *analgesics* and *anæsthetics*, such as opium and its derivatives, Indian hemp, cocaine, chloroform, butyl chloral hydrate, antipyrin, exalgin, &c. We must remember that a discomfort may be of the nature of a violent itching, an attack of hay-fever or of asthma, a palpitation—in short, anything that disturbs ; it is not therefore restricted to pain in its narrowest acceptance.

Under the head of Stimulants we must include all those means which supply either an agreeable sensation in some particular nerve area, or a general sense of well-being, or Euphoria, as it is styled ; so attractive may the latter be that the *habitué* is willing to purchase it, even at the price of a decided local discomfort. As examples of these two forms of stimulation we have on the one hand the snuff-taker, who gets his enjoyment from the titillation of certain branches of the fifth nerve ; on the other, the morphinist, who buys willingly his Euphoria at the price of the pain of the hypodermic injection. In the class Stimulants we find alcohol, tobacco, tea, coffee, opium and its derivatives, coca, Indian hemp, camphor, arsenic, &c. The majority of these, certainly those which are most sought after, combine an agreeable local effect with a general Euphoria.

In the seriatim consideration of the more striking

examples of drug habit, the first place must be given to opium and morphia.

Opium, the crude drug, is of very complex constitution ; it contains, amongst other ingredients, a number of alkaloids, of which morphia is the chief. So predominant is the action of the last named substance, that for practical purposes we may regard the effects of opium as due to the contained morphia, and the two habits may therefore be treated as one. Opium is either inhaled by smoking, or swallowed, and in the East these methods of ingestion constitute the habit, whereas in Europe it is in the form of morphia rather than of opium that the drug is taken.

The beatitudes of the opium smoker, whilst his dream lasts, are common knowledge, but the singular excitant effects of opium are less well known ; yet these may, in certain cases, be so overpowering that the sedative effects recede into the background, and as a soothing agent the drug is disqualified. Apart from these exceptional cases, however, the drug, whilst proving a true sedative, removing pain and all sense of discomfort, may confer a feeling of *bien être* and of increased power, both intellectual and bodily, which taken together constitute the chief part of its attractiveness. In that cruel competition of many years ago, the ride from Vienna to Berlin, morphia injections on the horse were practised in some cases, in order to stimulate the flagging powers of the animal to further endurance, and Brouardel records a similar use among the Arabs, horse and rider sharing the dose of

opium on the forced journey.¹ This stimulant effect of opium and of morphia is often most strikingly witnessed in the opium-eater or morphia *habitué*; it is, of course, a passing effect only, but it certainly warrants the exclamation of one observer, "Opium, mehercle, non sedat!" According to some victims of the habit, the impulsion is less for the positive pleasures of the stimulation than for the removal of the craving, which is described as a "horrible sensation."²

The opium habit, however the drug be taken—inhaled, eaten, or (as morphia) injected under the skin—undermines the health, psychical, mental, physical, and produces a pallid, unhealthy-looking being, unkempt, of anxious expression, unsociable, irritable, restless, shifty, of enfeebled will and intellect, and devoid of powers of concentration and application. Such a being will complain of lack of appetite, and very probably of gastric disturbances, of insufficient and disturbed sleep, and maybe of hallucinations. Suspicion of the possible underlying cause will grow if it be observed that the general state of depression is interrupted by recurring unaccountable periods of elevation if not of actual excitement—these periods corresponding to the times of dosage. It will be useless to tax the patient with the habit, for it is impossible to rely upon the assurances given, and under these circumstances, in order to make certain, it may be

¹ *Op. cit.*, p. 50.

² "Morphinomania and Allied Habits," Dr. H. C. Drury, "Encyclopædia Medica," 1901.

necessary to have the patient isolated and watched; the habit arrested, there will then appear the characteristic, often violent, symptoms of the enforced abstinence. It is important, further, to remember that examination of the renal secretion will detect the presence of morphia, and that the skin of the patient who takes his morphia hypodermically, besides being marked all over with needle pricks, may show scattered inflammations and sometimes extensive subcutaneous abscesses, the contents of which are particularly fœtid.

It has been established that the unborn child may acquire the habit from the mother; this is not surprising, seeing that the saturation of the parental system with morphia must involve a saturation of the system of the offspring. Such children after birth may show a restlessness and sleeplessness which resist ordinary treatment, but at once yield to a dose of morphia. No more striking object-lesson on heredity, and the directness of touch which exists between offspring and parent, could be given than this, and it is the more valuable because the causal *modus operandi* is so on the face of things: the morphia absorbed, circulating in the blood of the parent, must by diffusion find its way into the circulation of the infant; the close contact between the two circulations of parent and offspring being adapted to this very end, intercommunication. But if this holds for one drug, opium, must it not hold for all drugs, alcohol, chloral, cocaine, &c., the activities of which depend on soluble substances?

This, of course, is not the only way in which

habit works *viâ* heredity, for the morphinist father tends to beget children whose vitality is from the beginning not only seriously impaired, but specifically biassed.¹ How could it be otherwise, since every influence within the body tells in the up-building of protoplasm, and since the composite protoplasm of the germ borrows its qualities from every form of protoplasm in the parental organism? That microcosm, the parent germ on the father's side, must therefore incorporate in itself and pass on the morphia influence present at the time of its synthesis, and the difference between the maternal and paternal influences will lie in this, that the former will include not only the last-named indirect synthetic element, but also the direct influence of the circulating poison.

Drugs differ remarkably amongst themselves in the readiness with which they develop habit: for some the tendency is very strong, for others it is comparatively weak; it is present, however, for all. In the case of opium and morphia it is very strong, and for this reason the risk must ever be kept in mind; and if there be a history in the patient of a tendency to habit in other directions, *e.g.*, towards alcohol, or of such a tendency in the patient's family, or if either in the one or the other the evidence of want of control is forthcoming, then the administration of this drug should, if possible, be avoided.

In Louis XV's time life in court circles so centred in the monarch, that his refusal to listen to words of recommendation spoken on behalf of this

¹ Brouardel, *op. cit.*, p. 68.

or that candidate for royal favour was, "if not a death sentence, at the least a veto on life," so says Alfred de Musset in "*La Mouche*."¹ These words may well find their application to the drug habit, when this concerns the more potent medicaments, such as opium and alcohol, for their victim, whether near to or far removed from death, cannot be said to live. A very needful qualification must here be repeated, viz., that we keep the word "habit" for those cases *which have outgrown control*, for it is possible for the individual to acquire the custom of a drug, even of morphia, yet to so keep it within limits that the health does not suffer appreciably; this individual drives a dangerous animal, and at his peril, but he still drives.

The activities of opium and of morphia are concealed under a variety of names both in official preparations and in proprietary articles; chlorodyne is one of the best known of these. In these cases, the admixture of many more or less potent ingredients complicates the problem of the particular intoxication, but in the main the action of these preparations is that of an opiate. From opium or from morphia an alkaloid, codeia, is obtained, and from morphia various derivatives, *e.g.*, heroin, dionin, peronin, all more or less sedative, are derived; numerous others are on the horizon, with their virtues and vices in store for us.

Indian Hemp.—On account of its antiquity and its world-wide use, Indian hemp, Cannabis

¹ "*Contes*."

Indica, may next claim attention; at the present moment it is "indulged in almost all over Africa and the greater part of Southern Asia, especially in India and Persia . . . its introduction into Western Europe was mainly due to the Crusaders."¹ The natural products of Indian hemp figure as gharas, ganjá, and bhang, but very numerous preparations present the drug under the collective name of hashish. Some of these are merely agreeable presentations, but others contain important admixtures, such as stramonium, camphor, nux vomica, cantharides, musk, opium, alcohol, tobacco:² these of course yield composite effects. A resinous substance characterises the Indian-grown plant, and to this belong the activities of hemp.

And what is it that hemp bestows upon its million devotees? A dreamy lethargy, in which the cares and worries of life find no place, but in their stead the phantasy conjures up visions more or less vague, often more rather than less extravagant, but always pleasing. At times these phantasmagoria are singularly vivid and rich in colour, and, indeed, characteristic of the delirium of hemp is the unfettered liberty of the imagination. Is this true excitation, or is it the result of a loosening of that control which normally keeps within bounds, and in due order, the imaginative faculties? It is difficult to say, but inasmuch as that great controlling

¹ Dr. C. R. Marshall, "Text-book of Pharmacology and Therapeutics," ed. by Dr. Hale White, 1901, p. 315.

² Marshall, *loc. cit.*

influence, the will, is in abeyance, it is more than likely that the effects are due to a loss of control, the fancy careering on a loose rein. However this may be, the sensations experienced are so full of delight that everything is sacrificed to them—here is a mad rapture to be had for the taking of a teaspoonful of hashish.¹ A preliminary stage of excitement may precede the dreamings, and sometimes this may be almost maniacal in its violence; at other times various unpleasant peripheral effects may be forerunners, *e.g.*, noises in the ears, numbness of the extremities, and with these may be feelings of apprehension;² but the price is paid without hesitation, nor does the after-stage of heaviness and depression act as a deterrent.

The habit of Indian hemp long continued produces a chronic intoxication, marked by enfeeblement of the character and of the mind, together with a general depression of the physical powers. The victims become cachectic, and they are said to be liable to dropsy and to diseases of the lungs. There is a general impression that the continued abuse of hemp tends towards insanity of the maniacal or demented type.

The habit does not seem to grow with the rapidity of the opium habit, a given quantity maintaining its effect for a longer period, and this enables a custom of *small doses* to prevail

¹ *Vide* descriptions by B. Taylor; Pereira's "Materia Medica," ed. iv, vol. ii, pt. i, p. 370.

² Lewin, "Lehrbuch der Toxicologie," 1885, p. 271.

very extensively in the East without apparent serious detriment.¹ This is, of course, a relative advantage, but it amounts only to this, that hemp is less harmful than opium and morphia: that it may create a most pernicious habit is quite certain, as also that it tends to outgrow control upon a great scale.

A graphic picture of an ecstasy, evidently the result of Indian hemp, is drawn by Gustav Freytag in his description of one of the followers of the Knife, the Assassins of Lebanon; these were known to be particularly addicted to the use of hemp.²

Coca, Cocaine.—The use of this drug, though of quite recent date in Europe, is an ancient practice in South America, where from time immemorial it has been in vogue among the Indians. The active principle, cocaine, an alkaloid discovered by Niemann in 1859, seems to reside chiefly in the leaves of a shrub, named *Erythroxylon Coca* by Lamarck in 1749. Trousseau and Pidoux, writing in 1877, and quoting from Dr. Moreno y Maiz's thesis of 1868, foresaw the important rôle the drug was to play in medicine, but it was not till 1884 that Koller introduced into practice the striking properties which his predecessors, and in particular Wöhler, had announced.³ The most notable pro-

¹ Cushny, "Text-book of Pharmacology," ed. ii, p. 228.

² "Die Brüder vom deutschen Hause," ed. xxv, pp. 374, 375; see also Marshall, *op. cit.*, p. 315, footnote.

³ Trousseau et Pidoux, "Traité de Thérapeutique," ed. ix, vol. ii, p. 793; also Binz, "Lectures on Pharmacology," New Sydenham Society, vol. i, p. 129.

perty of cocaine and of its salts is its power to paralyse and benumb when applied directly to the tissues. Its influence upon the sensory nerves in this direction has led to a widespread use of the medicament both in medicine and surgery, particularly the latter; and in a large proportion of minor operations it has replaced the general anæsthetics, chloroform, ether, and the like: its action, however, is short-lived. Certain drawbacks attend the local application of cocaine, and it is already being displaced by rival benumbing agencies, such as stovaine, alypin, novocaine.

Cocaine and its salts are freely absorbed, and when applied locally they rapidly find their way into the general circulation, and upon this there appears another set of effects which concern us more immediately. These effects are very complex and, as a whole, difficult of clear interpretation, doubtless in chief part because of the co-existence of peripheral and central actions, and their partial conflict. However, there comes out very clearly a stimulant or excitant action upon the central nervous system, and especially the brain. The action has many resemblances to the action of tea and coffee—there is, for instance, a sense of exhilaration and of refreshment, and whilst fatigue disappears, the desire for activity, mental and bodily, reappears, the subject of the drug feeling buoyant, light. A certain amount of benumbing is probably present even here, for there is a general freedom from discomfort, and with small doses this tranquillising effect may be the most noticeable. It is to be observed in respect

of these stimulant effects, that not only is there the sense of greater capacity for work, but actually a greater power of performance. Large doses of the drug stimulate to the point of excitement, which on the motor side may show itself in a marked restlessness, in tremors, and even convulsions, whilst on the mental side there may be great volubility, incoherence, and even delirium, with persistent sleeplessness. It is for the effects of small and medium doses that cocaine is sought, and, as in the case of morphia, whilst it is pain or some discomfort which invokes the aid of the drug, it is pleasure which converts the chance visitant into a close companion.

With use a rapid tolerance is effected, so that the dose tends to mount quickly. Among the Indians the coca habit takes the form of leaf chewing, a little alkali, potash, or lime being admixed with the leaves. The danger of this Indian practice is not comparable to that of the European habit of swallowing or injecting the alkaloid and its salts. It follows that whilst among the Indians over-indulgence is comparatively rare, among the Europeans the cocaine habit is in the front rank of drug cravings. It is not uncommon for the cocaine habit to exist along with the morphia or alcohol habit, the cocaine having been introduced in the vain hope of breaking the one or other habit already acquired.

In whatever way formed, the habit, once established, undermines the health : the blood is spoiled, nutrition impaired, digestion vitiated ; the pallid, emaciated dyspeptic illustrates this sufficiently. In

addition there are marked symptoms of a vasomotor type, such as palpitations, attacks of breathlessness, cold sweatings; further, the patient complains of nerve disturbances such as numbnesses here and there, perverted sensations, itchings, creepings. Hallucinations of the various senses are frequent, and these may underlie very troublesome delusions, as, for example, that the body is infested with vermin: in the end, pronounced delusional insanity may ensue. Apart from such extreme cases the confirmed cocaineist shows in a marked degree loss of memory and of the power of sustained attention, as well as a weakened volition and a complete lack of enterprise or "go"; sleeplessness is likely to be a feature of his case.

It must be clearly understood that the cocaine molecule holds no energy, of appreciable amount, at the disposal of the economy, and therefore that those recorded feats of endurance, achieved under the influence of coca upon a minimum of food, derive from the energy stored up within the system; accordingly that during this period of stress the subject of the drug influence is "auto-phagous," as Trousseau and Pidoux put it. It is possible that coca enables endurance by economising the output of energy, converting the machinery for the time being into a more perfect type of transformer, but this will only be to reduce the rate of autophagy—the source of the energy will be the tissues alone, and it will be useless to look to the drug for either reinforcement or replenishment.

Tea, coffee, cocoa, kola, maté, guarana together form a group of natural products, scattered widely over the surface of the globe, and greatly in request on account of certain stimulating principles which they contain. These principles belong chemically to the Purin class, which includes the uric acid group; they are allied more immediately to one member of the Purin class, viz., xanthin,¹ and are named caffeine, theobromine, theophyllin. Structurally these bodies are quite distinct from cocaine, but in their action they bear much resemblance to it both pharmacologically and toxicologically. Infused in water, the natural products quickly yield their active principles to the liquid, owing to the free solubility of these, and from such infusions may be obtained both the dietetic and medicinal effects of the group. Medicinally a wide range of usefulness characterises the group; thus in weak states of the heart and circulation; in deficient renal secretion; in certain states of the nerve centres marked by want of vigour or lack of control; also in some poisonings, *e.g.*, by alcohol and opium, in which the activities of the nerve centres have been depressed—in each and all of these the stimulant action of the group may be sought. It is, however, to the dietetic use of tea and coffee that chief interest attaches, this use prevailing because of the stimulation which the nerve centres experience. The effects of the *moderate* enjoyment of tea and coffee are too familiar to need more than the

¹ See Abderhalden, "Lehrbuch der Physiolog. Chemie," 1906, pp. 303, 304, *et seq.*

briefest allusion : fatigue is replaced by a sense of refreshment ; there is actually an increased capacity for labour, both physical and mental ; the senses are quickened—the ideas flow readily but not loosely, for there is no want of control ; the mind is critical and the judgment sound ; without question there is here a true cerebral stimulation. This “liqueur au poète plus chère,” of which Delille discoursed,¹ is no less dear to the man of letters than to the man of science. A drawback to its action is that the brain is often too much enlivened, and if taken in the evening a wakeful night may follow. It is more than probable that in the general invigorant action a stimulation of the circulation and respiration plays a part, even with the smaller doses.

Susceptibility is often pronounced, and may amount to idiosyncrasy in respect of the whole group ; on the other hand, some people are very resistant. In the former case, a moderate dose yields effects which are really toxic and which may compare with the effect of a massive dose of strong tea or coffee on the average man ; we may then witness a marked restlessness of body, tremors, jerkiness, some complaint of fulness in the head, noises in the ears, confusion of thought, and a flow of ideas bordering at times on a state of mild delirium ; with these symptoms there may be palpitations and precordial distress.

Prolonged abuse of the group establishes, no doubt, a certain amount of tolerance, but, on the other hand, in some directions there seems to be

¹ See art. “Coffea,” Mérat et de Lens, *op. cit.*, vol. ii, p. 348.

a cumulative tendency. Tea-tasters are said to suffer from headaches, noises in the ears, troubles of sight, vertigo, sleeplessness, together with motor disturbances and an impaired digestion;¹ but, apart from such professional victims, it is common knowledge that the excessive use of tea and coffee may underlie a group of nervous manifestations the feature of which is instability or irritability, accompanied by a persistent sleeplessness, and various forms of dyspepsia. Murray, writing on the subject, says "it begets and increases a hysterical and hypochondriacal state,"² and Hahnemann is very incisive on the detrimental effect upon the national character of the German people of this "*boisson médicinale*."³ This indictment is a very serious one, and it ought to be examined into anew, tea and coffee having now been in vogue in Europe since their introduction about the middle of the seventeenth century,⁴ whence on, the custom has steadily grown, until within the last sixty or seventy years it has assumed proportions now truly colossal. What has been the outcome? This is very difficult to determine. Trousseau and Pidoux, writing in 1877, think that Hahnemann erred perhaps only by exaggeration, when he accused coffee of having contributed in the production of neurotic affections (*maladies vapoureuses*), affections which

¹ Lewin, *op. cit.*, p. 369, quoting from Morton.

² Trousseau et Pidoux, *op. cit.*, vol. ii, p. 785: "hystericum et hypochondriacum malum gignit et auget."

³ *Ibid.*, *loc. cit.*

⁴ Mérat et de Lens, arts. "Coffea" and "Thea."

they allow to be more common during the last one or two centuries: they add that Tissot and many others had already suspected this connection. The neurasthenic, it is true, is no new creation,¹ but he is surely more in evidence; and there is the impression—is it a false one?—that he is multiplying himself at an increased rate. Granting that he be, are there not many possible causes in modern civilisation, in this life at high pressure, other than tea and coffee? Clearly; but we have only to walk along the streets and note the striking multiplication of the tea-shop in our midst, to become confirmed in the suspicion that in life at high pressure this tea and coffee habit plays a part, seeing that it is one of the means by which the stress is met. Again, as in the case of coca, we seek in vain in the molecular structure of the alkaloids of this group for that energy which they let loose.

More than a hundred years ago, in 1793, Murray wrote concerning coffee,² “Hence let men of letters beware lest they be intemperate”; his caution must be enlarged into let *all* beware: in the cause of temperance all are concerned. Fontenelle³ said that coffee was a slow poison; he meant to be derisive as having proved its harmlessness in his

¹ *Vide* art. “Neurasthenia,” by Rudolf Arndt, “Dict. of Psychological Med.,” ed. by Dr. Hack Tuke.

² Andreæ Murray, “Apparatus Medicaminum,” vol. i, p. 566, 1793, “hinc litterati caveant, ne modum excedant”; he is citing Tissot.

³ Mérat et de Lens, *op. cit.*, art. “Coffea,” p. 348.

own person—he did not know that of the working of some poisons only the race can speak authoritatively—the compass of the life of the individual is too restricted to test the question.

Alcohol.—Into the physio-pharmacological value of the alcoholic molecule, in how far it can make good its claim to have a food value, in how far it must be considered as a drug pure and simple, we cannot now re-enter ; neither can we discuss its medicinal utilities and indications, but must limit our attention to its effects once it has incorporated itself as a habit.

The habit of alcohol is of two kinds ; there are those who condemn themselves to the fabled fate of the Duke of Clarence—the butt of malmsey : they soak, they drown in the poison. The habit of these is the habit of the massive dose ; on the other hand there are those who keep the measure of quantity but not of time—they are always sipping or nipping. These are the dram-drinkers, whose habit is the small dose. The consequences of the massive dose are in the eyes of all men ; the drunken fit is known of all. In this case the effects of the poison fall most manifestly upon the nervous system, and, setting aside a somewhat disputed stage of real stimulation, they soon declare themselves as a loss of control, in which the thoughts first slip rein and then quickly become incoherent. Next the movements of the body follow suit and in their turn become disorderly. Carried a stage further, depression gradually abolishes the tumult it has

itself created, and in the end, having effaced all the higher faculties, it proceeds to threaten those fundamental centres of organic life—the respiratory and circulatory—which are among the earliest to organise and are the most stable. Life is now in immediate peril, and the drunken stupor may end in death. The open infamy of the massive dose of alcohol has its deterrent advantages, since hereby habit stands pilloried in the market-place.

Less prominent, but scarcely less pernicious, are the effects which follow on the habit of the small dose, and they are the more grave because they are more hidden and may escape exposure. It is in the lowered vitalities of the tissues that we must seek for these effects, and we find them in the readiness with which the seeds of consumption take root in the alcoholic subject, also in the gravity which acute disease acquires (for instance, pneumonia), by reason of the impaired organic resistances. Again, we find them more specifically in the spoiling of certain organs, which the selective affinities of the drug single out. These organs or systems are, the alimentary tract, the liver, the kidneys, and the nervous system, and inasmuch as these organs are vital, the groups of symptoms which arise may be of fatal import; here belong hæmorrhages, dropsies, and poisonings of the system, due to a faulty metabolism or defective elimination (uræmia); here also belong nerve paralyses (peripheral neuritis), delirium tremens, alcoholic insanity. To the list we must add a serious form of heart-ailure, due to degeneration of the walls of the

heart, and it is probable that a widespread degeneration of the blood-vessels, with all its attendant dangers, owns a similar origin.

Apart from these direct damages due to the circulating poison, the habitual drunkard, whether of the massive or of the small dose type, is stamped by the usual characters—mental, moral, and physical—which belong *per se* to loss of control; we need not recapitulate them.

The alcohol habit has raised its head so high that it has become a national question against which statutes are levelled and Governments tilt, and nothing less than a separate volume¹ can do justice to its demerits. We must, however, insist upon the fact, continually preached, yet scarcely now sufficiently realised, that in the matter of alcohol a man is not necessarily sober because he never loses his head. In the make up of the sober citizen other organs besides the head count, and we have seen in how many directions this drug imperils the system. After the foregoing enumeration of the effects of dram-drinking it will therefore be clear that this is one of the worst forms of drug habit, though its victims be never actually *drunken*.

It is taught by some that drunkenness may beget a nerve state or psychosis, which can be transmitted, but whether this is a particular psychosis, to be labelled alcoholic, or whether it is not rather a psychosis indicative of want of

¹ See "The Drink Problem," in the New Library of Medicine.

control towards all forms of temptation, is difficult of proof. Either hypothesis, in the presence of the accessibility to alcohol which exists nowadays, would cover the fact that the alcoholic tends to beget the alcoholic; this statement holds, quite apart from the working of the home influence in the sense of example or of direct encouragement to partake of the poison. Finally, in connection with this, we must not forget that where the mother is the alcoholic there will be something more than a mere handing on of a psychosis: there will be actual contact of the poison with the tissues of the offspring during the nine long months of pre-natal life. A nine months' course of so potent a drug as this must confer a bias: in the case of morphia this has been actually proved.¹

These remarks have reference only to the habitual use of alcohol in excess.

¹ This subject is amplified in Dr. Herbert French's Goulstonian Lectures for 1908. It is there shown that not only may chemical substances pass from mother to child, but that bacteria also may so pass: this has been proved for the organisms of tubercle, of pneumonia, of anthrax, and various other infections. This passage, whether for chemical substances or for living germs, is not unlimited, and it is, as we might expect, subject to selective action, *i.e.*, certain substances find readier passage than others: thus, whilst copper and lead salts pass easily, arsenic passes with greater difficulty, and mercury finds an almost impenetrable barrier. This "barrier action" is variable also according to the health of the mother, many substances being allowed to pass during a state of ill-health, which would have been barred if the resistance of the tissues had been at its highest.

Tobacco.—The introduction of tobacco into Europe and its spread, date from the middle of the sixteenth century; there are suggestions that the knowledge of the plant did probably reach the West from Oriental sources at a much earlier period, before, in fact, the discovery of America, but these suggestions are obscure,¹ and we look to the year 1560, or thereabouts, as the authentic time of its entry into Europe, and to Jean Nicot, then French Ambassador at the Court of Portugal, as the original of the Christian name of the plant, *Nicotiana tabacum*: the derivation of the word “tabacum,” or tobacco, is somewhat uncertain. Tobacco has vied with tea and coffee and alcohol in the extent and rapidity of its spread, and, like them, its custom is now worldwide. Its relation to these other habits may be described as associate, since it is often conjoined with them, and tends to enhance their enjoyment.

At one time tobacco was much employed as a medicine, but it is now so little in medicinal demand that it has at length been omitted from the last edition of the “British Pharmacopœia,” and its use as a drug does not therefore figure in the development of the tobacco habit. The leaves are the parts of the plant utilised, and the method of utilisation threefold, viz., snuffing, chewing, and smoking. The innumerable snuff-boxes of the eighteenth century witness to the prevalence of the habit,

¹ Murray, “Apparat. Medicam.,” vol. i, p. 682, “Fatendum tamen vestigia ejusdem ex Asia obscura esse”; see also Mérat et de Lens, *op. cit.*, art. “Nicotiana.”

and the art expended upon them is testimony sufficient to the high regard of the world of fashion for the custom: snuff-taking is now a rarity, almost an oddity. Chewing has never been a popular practice, though favoured in certain callings, and particularly in the navy; neither it nor snuff-taking has ever approached in magnitude the habit of smoking. In the tobacco leaves are a number of constituents, amongst which nicotine, an alkaloid of complex structure, is credited with the chief activities of the plant. In the act of smoking the constituents of the leaf must undergo more or less change, but the analysis of the smoke seems to discover a certain proportion of unchanged nicotine, and the general view is that this alkaloid is its most active ingredient.¹ The pharmacology of nicotine is as complicated as the structure of its molecule, and no good purpose would be served by endeavouring to bring the effects of the alkaloid on the various tissues and organs into accord with the effects which are observed when the abuse of tobacco has led to a chronic intoxication; it will be best, therefore, to pass at once to these. The pungent smoke of tobacco is a local irritant, and a chronic form of congestion of the throat and larynx is a frequent result of excessive smoking; the smoker's cough and the smoker's voice are familiar. The smoke absorbed into the system, a gastric disturbance may ensue and a

¹ "Text-book of Pharmacology and Therapeutics," ed. Hale White (art. by Theodore Cash), 1901.

marked functional disturbance of the heart, characterised by a feeble, irregular, or intermittent pulse and a tendency to palpitation; sometimes attacks of heart-pain simulating the breast-pang of angina occur. The nervous system may show its intolerance of tobacco by a tremulousness and unsteadiness of the muscles; by attacks of giddiness, which, though in many cases referable to the gastric disturbance, are in other instances, seemingly, a direct nervous effect; by neuralgias in various areas: possibly the attacks of heart-pain above-mentioned are of this nature. On the mental side the memory may suffer notably. Various severer nervous affections have been attributed to tobacco excess, but the causation has not been established, and the occurrences have more probably been coincidences; there is, however, one special nervous affection which is almost certainly assignable to tobacco poisoning, viz., impairment of sight, though it is doubtful whether even this ever leads up to true tissue changes, the amblyopia disappearing if the habit is checked.¹

There can be no doubt that all forms of excess are more resisted by the tissues of the adult than by those of the child, for the growing child, when compared with the adult, must stand as a relatively unstable organism and be more at the mercy of every disturbing cause. This consideration has special weight in respect of tobacco, since the habit

¹ See art. "Tobacco," Theodore Cash, *loc. cit.*; also H. Richardière, "Tabac"; "Traité de Médecine," Bouchard, Brissaud, vol. iii, pp. 683, 684.

is apt to take root at an early age, when development is proceeding actively. Here is a matter of national importance, which should occupy the attention of those interested in the physical welfare of the race.

The Soporifics.—The more common a complaint, the more accessible the means for combating it, the more suspect must those means be from the point of view of habit contraction. Sleeplessness is unfortunately a very common complaint, and it is often so distressing that it is no wonder the soporific should loom very large in our midst. Fifty years ago the sleep-producing list was a comparatively limited one; in Pereira's "Materia Medica," Edition iv, 1854-1857, the Somnifera include the *spirituous* group—alcohol, ether, chloroform; the *opiate* group, monopolised by opium; the *Indian Hemp* group, containing hemp and its many preparations; and the *Solanaceous* group, comprising belladonna, henbane, and stramonium. Besides these were some very unimportant drugs, such as lettuce and hop.¹ And now, since Liebreich led off with chloral hydrate in 1869, what an array!—chloralamide, chloralimide, chlorobrom, bromal hydrate, paraldehyde, sulphonal, trional, tetronal, veronal, hedonal, proponal, bromural, &c., to name only some of the more important introductions, including the most recent. Nor is there any prospect of finality, for the manufacturing chemist has been set agoing, and he will not stop. Syntheses to right, syntheses

¹ Vol. i, p. 219.

to left; here the substitution of a grouping of methyl or ethyl, or what not, in place of an atom of hydrogen, there the introduction of an atom of chlorine or of bromine in place of some corresponding valency; means such as these furnish molecular permutations and combinations without limit, and unfortunately also the new products have a commercial value as well as a scientific interest.

It is impossible to consider each form of habit which this list of drugs may engender. Each makes its *début* as an agent brimful of sleep, yet void of all offence, in particular of the offence of habit production; each new claimant by its own pretensions denies, *ipso facto*, the pretensions of its predecessors and prepares the mind for its own fallibility. The plain fact is that, one and all, they buy sleep at a price, however much they may protest; also that, although amongst themselves they do differ greatly in the rate of habit production, yet the tendency thereto they all possess inherently. As good householders it is for us to secure the maximum of value at the minimum of cost.

Chloral hydrate, the *doyen* of the group, still holds its own as a valuable hypnotic, but long continuance of its use leads up to a well-recognised craving in which, along with mental weakness, symptoms closely resembling delirium tremens may figure; there is, further, the usual loss of moral sense, and emotional weakness, and the general nutrition of the body may suffer markedly.

Sulphonal was long held up as free from habit risk, but, though it may rank as relatively safe in

this respect, the toxic effects of habitual use are well established. The writer has seen symptoms closely resembling those of delirium tremens from this drug, along with mental and physical weakness. In the symptom hæmatoporphyrinuria, a renal symptom, we have, when present, a valuable means of detecting an unacknowledged habit or of controlling the administration of the drug if habit has not yet appeared.

Paraldehyde is perhaps one of the safest of all hypnotics; in favour of this we have the authority of Dr. Savage, who speaks of having only once met with the paraldehyde habit. It has two excellent characteristics—a very unpleasant taste and an odour which declares itself in the breath. The result is that *per se* it is unattractive, and next that the same breath which denies the habit gives itself the lie.¹

Veronal is still on the very crest of the wave of favour, but in “Merck’s Annual Reports”² we find the statement that “if its use be discontinued from time to time no unpleasant secondary effects are to be feared, for cachexia does not occur unless veronal be used continuously,”—*et tu, Veronal!*

We have seen that in cases of severe pain our first and last appeal is to opium and the opiates. There is, however, a class of painful affections in which opium is either not indicated at all, or in which

¹ See Dr. Savage’s article on hypnotics, Hale White’s “Text-book of Pharmacology,” 1901.

² Published May, 1907.

recourse should be had to other remedies, at any rate in the first instance. This class comprises the headaches and the neuralgias. To meet these affections a large number of drugs have arisen, among which the synthetic products are conspicuous: here we find antipyrin, with its derivatives bromopyrin, salipyrin, pyramidon; phenacetin and its derivatives—lacto-phenin and phenocoll hydrochloride; antifebrin and its offshoots—phenalgin and exalgin. These are only some of a long list, but a longer list is forthcoming, for synthesis is proceeding very actively in the laboratories. Headache and neuralgic troubles are very prevalent, and these drugs are practically in the hands of the public, among whom the sale is a growing one. The consequence is that habit is making its appearance here also, and undeniably much harm results therefrom. Habit, however, does not assume the same disastrous dimensions as in the case of the Soporifics, the alcohol group, cocaine, and the opiates, for the reason that these analgesics are not sought exactly for any pleasure they may bring. Pain they do negative, enjoyment they do not beget, certainly in no degree comparable to that which the groups just named confer. The harm which results from the class of drugs which we are now considering is due to the fact that they are very potent medicines; some very depressant in their action, in particular upon the heart and circulation, whence there may result faintings, lividities, collapse: certain other symptoms may attend their use. It is true that these effects are comparatively infrequent,

and that they seem in many cases to depend upon idiosyncrasy (*i.e.*, an individual, unaccountable susceptibility), appearing perhaps upon the single or double administration of quite a moderate dose.¹ These unusual effects have been recorded with sufficient frequency to make clear the potency of the drug, or, if it be preferred, the susceptibility of the organism, and to urge the caution that they should not be taken recklessly.

This brief mention of an important group does not adequately meet its claims upon our attention, but it must suffice and must conclude the sketch of the particular habits—a sketch illustrative only. It were possible else to lengthen out this part indefinitely ; for, it must be repeated, habit may arise out of anything, even of materials seemingly the most unpromising ; thus men may accustom themselves to the taking of arsenic, as is on record for the arsenic-eaters of Styria. But whilst this is so, we must re-insist that what is here for *abuse* is by implication here for use, and that we must not let ourselves be so much intimidated by the bogey of intemperance as to deny ourselves the privileges of temperance—also that temperate use may mean not only occasional use, *pro re natâ*, but also habitual use *in moderation*. Reduced to finalities, the whole matter becomes a question of dose and of control.

¹ See Hare, "Antipyretic and Analgesic Drugs."

PREVENTION OF HABIT

HAVING looked at the thing itself, Habit; having regarded its nature and the means best fitted to cope with it, Control; we must now consider the applicability of the means. With this objective before us it may be asserted without fear of contradiction that the first essential to the prevention of habit is a good parentage—the child about to enter the arena of life must come of a good stock. Admirable precept, but a little belated, seeing that we, the generation actually in possession of the boards, have had no voice in the selection of our parents. This being so, if the precept is still to stand and we are to take our share in shaping the destinies of the race, there is nothing for it but to stretch as far forwards as possible, since backwards we may not reach, and select the parents of our grand-children by selecting the education of their fathers and mothers. Here is the soil, our own children, not virgin by any means, but full of tendencies, of predispositions, of potentialities—these qualities we do not create, but we may develop, and the first task to our hand is to implant the good habit and build up the strong places of control.

In the tissues of the body we know that one seed implanted may, or rather will, conflict with another seed implanted, since in the struggle for existence which ensues, each seeking for elbow-room, the less vital germ must needs give place. Physiologists have recognised this, and one of the most modern methods in applied physiology is to endeavour to oust one infection by inoculating another, the replacement being of the more harmful by the less harmful. Professor Metchnikoff's advocacy of the use of soured milk in certain alimentary-tract states is of this very kind. In the case of the Character, though its material basis is unknown to us, the same thing is true—the good habit and the bad habit are at essential variance, and there is not room for both. The one character cannot be at the same time punctual and unpunctual, prudent and thriftless, generous and selfish. You may say, these are mere words, and that generosity and selfishness and other seeming antitheses are forms of speech and no more, that it is all one in reality, and a question only of how you look at it; even so, if only *une manière de voir*, the antithesis remains a different *manière de voir*, and there is the beginning and the end of that argument. In so far, therefore, as education can modify the predispositions which already exist, in so far the parent is responsible to posterity for the implanting of the good habit and the building up of the strong places of control.

The *modus educandi* is of itself a chapter in Ethics and must be sought elsewhere, but it may be recalled

here that each time the will is exerted in control of an impulse, the resistance to the subsequent operation of that impulse is increased—nay, more, the resistance to the operation of any impulse is increased. It is quite true that a character may be strong in one direction, and weak in another in which the will-power has not been brought into operation; but each time the will takes effect in resisting in the one direction, it gains in potential in that other direction in which it has not been exerted; and, *vice versâ*, each time it fails to take effect in one sense it is weakened in that sense and in every other. Therefore before all things the will is to be fostered and directed—never broken;¹ in this wise, subject to a right direction, the will, like the piece of steel exposed to a rightly directed magnetic influence, tends with each operation to become more and more polarised in the right sense.

The wisdom of education lies not only in the encouragement of the will to operate, but in *the securing of a successful operation*, and therefore in the just apportioning of the magnitude of the task to the power available for its performance. It is important to insist upon this, that for the will to attempt what it cannot achieve and then, recognising this futility, to turn aside from its purpose, is to lose in power. In this enfeeblement it is the deliberate swerving from the path willed which is causal, not the non-achievement, which is neither here nor there, so long as the intention and the endeavour

¹ See Professor Clouston, "Hygiene of the Mind," p. 123.

hold true. For this just apportionment of task to power, the heir to Futurity, so long as he is a child, is "under tutors and governors," and it becomes their duty to see that the occasions for stumbling are not too many or too overmastering. What a good education can do by precept and example, what we may hope from it, is so well set forth in the first chapter of the "Thoughts of the Emperor Marcus Aurelius Antoninus," that we may refer all those who think the cause of education needs advocacy, to his words written "among the Quadi at the Granua."

The education of the child must be general, not special; of course, if there exist at the time special temptations—each age will present such—special warning and provision must be applied thereto, but it is useless to think of providing the child with an inclusive list of the dangers to come, the dangers and their remedies: the training must consist in an all-round tempering of the character—then, God speed. Such an one, if his destiny be to rule, may find, after probation, that he cannot better express his indebtedness than in the words of Marcus Aurelius, who gives thanks that he was subjected "to a ruler and a father who was able to take away all the pride from me, and to bring me to the knowledge that it is possible for a man to live in a palace without wanting either guards or embroidered dresses, or torches and statues and such-like show; but that it is in such a man's power to bring himself very near to the fashion of a private person, without being for this reason either meaner in thought or

more remiss in action, with respect to the things which must be done for the public interest in a manner that befits a ruler." ¹

We pass from parental responsibility to the responsibility of the State. To the acting generation the State stands *in loco parentis*; it presents the wisdom of the past as the ripe fruit of a long experience, and in its administration of the law of the land it is a government by seniors. In so far, therefore, as it falls to the State to supply or superintend the education of the nation, the same questions will arise that have already been raised in respect of the home; and it need only be said that until the State realises that, in all education, development of character must come first, it will never rise to the full height of the occasion and bring forth that fearless citizen, whom "the world's wreck would crush undaunted,"—that same man whom Habit could never enslave.

The duties of the State must next be examined as they serve to protect the people, and here no doubt opinions will differ according as the view is taken, on the one hand, that the State cannot be too paternal, on the other, that having put away childish things, the grown-up man may be trusted to look after himself. Wisdom, becried on either hand, will steer very nicely a middle course between these extremes; allowing here, forbidding there. Thus it may well be accepted that it is the duty of the State to watch over and secure the quality of the food

¹ Long's translation, Bohn's edition, pp. 75, 76.

supplies, so that in nutritional value these do not fall below an average value and are free from contaminants of all sorts ; that the same watchfulness should be exerted to secure a standard purity and strength of medicines ; and that in respect of those articles which come under neither head exactly, or may be classed under both, the same is requisite ; such articles are tea, coffee, cocoa and alcohol. This bears directly upon the question at issue, for, in the case of alcohol, the harmfulness of the habit is greatly accentuated by the fortifying of wines and the presence of impurities in the cruder products of fermentation.¹

Should the State go beyond this endeavour to present the food and the drug and the stimulant in pure form and standard strength ? This is a difficult question.

In the matter of drugs and of poisons the State has determined that protective duties are assigned to it, and accordingly, by the Sale of Poisons Act, it first secures that the dispensing of poisons shall be in the hands of persons proved to be competent by the tests of training and examination, and registered for this purpose under the Act ; next it imposes regulations to be observed in the sale of poisons—regulations designed to check an indiscriminate distribution of these drugs by fixing responsibility upon the seller, and by identifying and making traceable the buyer ; thirdly, it defines the word “ poison ” by scheduling the drugs classifiable

¹ The higher homologues of ethylic alcohol present in *fusel oil*, occur in the impurer spirits, and are very poisonous.

as such in the meaning of the Act. The purpose of the Act is to prevent accident and crime—accident by so putting up and labelling the poison that the overlooking of the poisonous nature shall be avoided as far as possible ; crime by the conditions surrounding the act of sale and by registering such act. The schedule of poisons is not a fixed list, for the Council of the Pharmaceutical Society has power by resolution to add to the list any article which it shall deem a poison within the meaning of the Act ; this resolution takes effect upon approval by the Privy Council. The schedule of poisons is divided into Parts I. and II. Part I. contains those which are hedged around with the more stringent precautions of sale ; Part II., those presumably less potent, because less circumstance is observed in dealing with them. It would be out of place and would take too long to discuss in detail the question whether the actual list of drugs, contained in Parts I. and II., is an effective *Index expurgatorius* in respect of the whole body of the Materia Medica—how far, that is, it realises the intention of setting apart all those drugs which are dangerous to handle because of the intensity of their powers, and labelling them correctly as harmful in the first or second degree.

It must however be urged that a schedule cannot be regarded as convincing, which contains under the heading “Alkaloids,” so meaningless a phrase as : “all poisonous vegetable alkaloids not specifically named in this schedule” : as well might the list close with the words—all poisonous *substances not*

specifically named in this schedule; this would be comprehensive if not comprehensible, seeing that specific naming is the one thing needful in a schedule which is to be a guide.¹ Further, it is not clear why corrosive sublimate is placed under Part I., whilst mercuric iodide, of nearly equal, if not equal potency, comes under Part II., and no room is found for the acid nitrate of mercury; why chloral hydrate is placed under Part II., though a familiar substance and a not infrequent cause of death, accidental or intentional; why sulphonal is singled out as a dangerous soporific, to the exclusion of trional, veronal, and others; why oxalic acid is mentioned and not the soluble oxalates also; lastly, why no mention is made of such powerful drugs as antifebrin and exalgin, to name but two from a large group of much used drugs in unrestrained currency. And this is the revised schedule which is to come into operation in April, 1909!

The Privy Council, in consultation with the Council of the Pharmaceutical Society, might with advantage labour this matter, and, moreover, might consider whether a Sale of Poisons Act should not be so framed as to guard the public not only more effectually against the dramatic perils of crime and accident, but also against *those more insidious approaches of habit* which the present Act scarcely contemplates. The last-named matter is one of considerable difficulty, and in respect of it the writer is not prepared to say

¹ The final clause in Part II. does actually foreshadow some such vague inclusive statement.

where wisdom would lead; but if the State is to be paternal and to be logical, it must see that habit stands to the race in much the same relation as the dose of poison stands to the individual: this threatens more immediately the well-being of the unit; that, eventually, the well-being of a nation. As things stand, preparations of Indian hemp, the trionals and veronals, the antipyrins and phenacetins and antifebrins, are procurable at will, *nemine contradicente*; whilst in the matter of many other harmful drugs, what is there to stand between them and the public but a label and the wise discretion of the chemist?—the last, however, acts in respect of these substances upon his own responsibility, and is not State-aided. In connection with this matter, the procurability of the poisonous drug by the public, an important question arises as to the length of time that a prescription should remain valid—a prescription, that is, containing an active poison in appreciable dose. At the present moment the doctor prescribes, say, morphia, or cocaine, or a combination of the two, for some specific purpose and for a time specified; this prescription becomes the property of the patient, and, armed with this, it is in his power to demand of the chemist the dispensing of the prescribed drugs an indefinite number of times. The responsibility which lies upon the doctor in such case is manifest, for here is habit made easy; nor can there be any doubt that drug mischief on a large scale is the result of this accepted practice.

How is the difficulty to be met and the rights of property reconciled with the safety of the individual? Dr. Brouardel¹ discusses this matter in relation to certain test-cases which have come up for jurisdiction in France, and he comes to the conclusion that in France the law does not *authorize* the repeated dispensing of a prescription of this kind except its repetition be ordered upon the prescription, and that if such repetition is ordered, then *each time the chemist dispenses the medicine he must affix his stamp to the prescription, with the date of the dispensing*. Without this safeguard there is nothing to prevent the patient from taking the same prescription to several chemists in succession and thus procuring a quantity of the drug dangerous to himself or to others. With this safeguard the chemist is made aware of the action of the patient and is warned of his own responsibility in the matter. This regulation, effectively enforced, would be a decided step in the right direction. Other nations besides France are in advance of ourselves in this respect. Thus in Denmark the pharmacist is supplied with printed labels which declare either that the medicine may be supplied an *indefinite* number of times "without the necessity of a fresh prescription," or that it may be supplied *once* only unless the physician renew the prescription or indicate how often the pharmacist may repeat the dispensing; the chemist thus refers the responsibility back to the prescriber,

¹ "Opium, Morphine, et Cocaine," 1906, pp. 130-134.

as is right. A similar practice is current in Germany.¹

If the recipient of the prescription were possessed of the knowledge of the prescriber, something might be said in favour of the laxity which prevails in our country; as it stands there is nothing to commend it.

The Alcohol question now presents itself in all its bulk; this no point of view can belittle, for whatever we may think of the value of alcohol when used reasonably, its abuse has grown into proportions of such magnitude that it constitutes a national calamity. To deal adequately with this subject is not possible here; all that can be attempted now is to look at the elements of the problem and inquire how these may be treated. What to do with those who have fallen victims to alcoholism is a question of cure, and must be postponed to the chapter which follows; for the moment we are concerned with prevention: how may drunkenness be obviated?

In the first place we must recognise that drunkenness arises in chief part from the use of the stronger alcoholic drinks, the spirits and wines and more heady beers, and, further, that the more crude the products of fermentation, the more contaminated the liquor, the greater the danger of intoxication. It is not the thin *vin du pays*, the clarets and white wines, it is not the lager beers which do the mischief, but the ardent immature spirits and the

¹ See "Pharmacy Notes from Various Parts of the World," pp. 4 and 9, W. Harrison Martindale, Ph.D., 1907.

fortified wines. In two directions, therefore, the State may help in this matter :—

1. By watching over the purity of the alcoholic supplies.

2. By controlling the fortification of fermented liquors, and by encouraging the trade in the lighter beers and wines. The grocer's license, designed to this end, does not seem to have worked in the desired sense.

Perhaps all will be agreed that in these directions, at any rate, the duty of the State is clear.

In the next place there is the drunken condition itself, which might be penalised if the shame of public opinion should prove an insufficient deterrent. To be drunk and incapable, a manifest nuisance, if not actual danger to the community (as in the case of those engaged in street or road traffic, or upon the lines of communication by sea and land), is to demand control, first on behalf of society, next on behalf of the individual who has put himself out of his own keeping. The practical difficulties here consist in the gradation of the state of intoxication, which makes it impossible to fix upon any point at which with justice the law should step in. Shall it be at George Herbert's "third glass"? If so, of what capacity shall the glass be, of what strength the liquor, to what individual capacity adapted? And when is control lost, and when is the judgment blurred? The lives of a multitude may depend upon these fine lines of distinction, yet the risk must be run and the lives sacrificed rather than that the even scales of Justice should be deflected a hair's-

breadth from their evenness. The law cannot fix the point when interference is justifiable, but must admit the principle of interference in the interests of the community; time and the occasion must justify the actual interference when it comes; whilst to the individual the right to challenge the interposition must remain, in the cause of liberty.

Next there is the licensed house to be considered, in this country the public-house or inn. The former name is honourable enough in its derivation (from the word *poplicus*), which tells that it is, or should be, the people's house, but it has acquired an evil signification, and the question is, how it may recover its fair fame and be reinstated in the estimation of the community—upon its signboard the legend *Pro bono publico*. Here is the problem, the reform of the public-house. This matter has exercised the consciences and minds of the best citizens throughout the world, and it has been variously solved; but it passes the wit of man to devise a perfect scheme, or one even roughly workable, except the conscience of the mass of the people be awakened to the need, and its goodwill engaged. This is the basis upon which every scheme must rest, and without which every scheme will prove futile, and this basis must be prepared and laid in the homes and schools of the nations. Perhaps the best known scheme is the "Gotenburg System," which, taking its origin in the town of Gotenburg, has gradually spread, and is now, by law, enforced (since the year 1865) upon the whole of Sweden. It has spread,

with modifications, to Norway and to Finland, and controversy rages as to its applicability to other European countries. The Gotenburg System provides that the monopoly of the sale of brandy shall be in the hands of a joint-stock company, the Bolag, which, worked by a small capital, earns a moderate or low percentage; the profits above the investment-yield being used for public purposes. The intention of the system was to eliminate the direct personal interest of the vendor in the sale of spirits, and at the same time to get rid of all those incitations to drink which trade rivalry begets; the illicit attractions of the bar were to be minimised as far as practicable, but in other respects the scheme provided that the public-house should be well lighted, clean, and above all managed with decency; moreover, there should be facilities for the procuring of food. To this end the managers of the licensed houses and of the shops for the retailing of spirits were to be employees of the Bolag, and in the hands of this society also was to be the issuing of licenses to hotels and the better class of restaurants. The regulations permit the sale of spirits only to those who are sober, and only to men, and youths above the age of eighteen, and, a matter of great importance, no credit is allowed. The hours of sale are fixed between 9 a.m. and 6 p.m. in winter, and 9 a.m. and 7 p.m. in summer, and on Sundays and holidays between 1 p.m. and 3 p.m., and on these days the sale is only allowed in conjunction with food. Those in charge of the public-house have no interest in the sale of liquor, but only in that of

food, coffee, mineral waters and cigars. Two commissioners act as overseers of the innkeepers and of the inns. The takings of the houses are handed in to the banks on a fixed day every week, and every fourteen days the Bolag takes stock. The Bolag pays a license tax to the town treasury, and the town and the State divide between them the entire nett profit of the liquor traffic thus systematised. These are the main provisions of the Gotenburg System, the working of which, as a thoroughly practical scheme, experience has amply proved.¹

The Norwegian control of the liquor traffic by the "Samslag," the equivalent of the Swedish "Bolag," differs in certain matters of detail, more or less important; *e.g.*, the system is made to apply not only to spirits but also to beer and wine; the taxing of sale licenses both retail and wholesale is upon a higher scale (as a result, brandy is much dearer in Norway than in Sweden); the profits of the liquor traffic are differently divided between the State and the community, and of the total profit 20 per cent. is held by the Samslag, to be used for anti-alcohol purposes.² More important to the whole question of control in Norway is the part played by local option, upon which there vote all persons over twenty-five (including women), for as result we have in a large number of communities, particularly in country districts, the complete prohibition of the

¹ "Gotenburger System und Alkoholismus," Dr. B. Laquer, Wiesbaden, 1907.

² "Die Norwegischen Samlags," *op. cit.*, p. 33.

licensed house. Finland follows on very similar lines, but goes even further, and it is not improbable that the Gotenburg System in that country may be replaced by State prohibition of the production and sale of all forms of spirits. To this end the "Friends of Temperance" have draughted a Bill which is to forbid the production, import, sale, and transport of all alcoholic drinks containing more than 2·5 per cent. of alcohol.¹

And what is the outcome of these efforts? In the case of Sweden—whilst granting the many benefits which have resulted from withdrawing the sale of spirits out of the hands of the private individual and so checking the scandals arising from the greed of private enterprise—Dr. Laquer concludes that the consumption of brandy in the towns has only been indirectly affected, and that its home consumption has been favoured; also that the death-rate from drunkenness and the percentage tables of insanity and crime due to alcohol show but a slight decline, likewise pauperism.²

A Quaker is credited with having said, "If we must have dirt, let us have it in the middle of the room, where all may see it, not in the corners"; there is much merit in the saying, and IF the reform of the *public-house* is to mean the deformity of the home, there are many of us who will prefer the public scandal. In saying this, we would by no means imply that this sequence is at all necessary;

¹ Laquer, *op. cit.*, p. 49.

² *Op. cit.*, pp. 30, 31.

on the contrary, we are strongly of opinion that the reform of the public-house, by removing the influence of the evil example, must lessen the corruption of morals. All that we would urge is that we should not be content with the disappearance of public disorder, but must probe this matter to the core. Something wrong there must be in a system like that of Gotenburg, which, Dr. Laquer says, gives to the stranger the impression that the licensed house is to some extent under ban, and that the people who frequent it have lost caste. This applies as much to the Bolags of Sweden as to the Samlags of Norway, and he quotes Dr. Bode as expressing his distress as he watched man after man enter the bar, lay down his money, gulp down his glass, and silently leave. Something wrong also if we consider that this lower grade of the people, at the very time that it is damaging its physique and earning contumely, is yet paying hard-gained money to town and State; perhaps is laying out a public park in which it will not even slouch, or furnishing a public library which it will never enter. The man who makes a fortune by means none too creditable, and then earns fame and name and a seat in the halls yonder by leaving to the public an ill-gotten wealth, which the Ferryman will not take on board—this man does good business in both worlds; these poor wretches which the Gotenburg System tolerates are adepts in the art of losing both worlds.

For the principle of local option there is much to be adduced; but when all is said and

done it is a tyranny—the tyranny of a majority ; and where this is a bare preponderance it may be an unjustifiable tyranny—*vox populi* it is not. This can be minimised by requiring a great preponderance of votes before allowing the majority to become operative, but if the individual has rights, *a fortiori* the minority has rights, and the ideal scheme should give these representation. May it, therefore, be commended to the prohibitionist or abolitionist :—

1. That temperance promises a higher moral yield than total abstinence.

2. That the aim of all education should be to develop character, to create a people strong-willed for good.

3. That it is possible to pay too high a price for sobriety, and that this excessive price is paid when liberty of action is forfeited.

It is all very well to protect minors and the immature generally, but when we come to the grown man and woman, who have put away childish things, it is otherwise—they must be allowed to choose, even if this choice be unto their own perdition. It would have saved much trouble if that Tree in the Garden of Eden had been surrounded by impassable *chevaux de frise* ; but it was ordained otherwise, and so the possibility of the sinner came into the world, and with him the chance of the saint—the one is not to be had without the other. Erect your barriers around the products of fermentation, make drunkenness impossible—you will not have met the standard of

morality which the New Testament sets, unless you have purged away the desire for drink ; he who would drink to excess if he had the chance is for moral purposes already drunken, so at least we are taught, and none will say that the standard set is a low one ; but the desire done away with, the barriers are unnecessary. It comes, then, to this : that it is not permitted to violate the principle of liberty in order to establish even a great virtue, temperance ; for liberty of action is the soil in which all virtues have their root. Sir Guyon, the Knight of Temperance, was the heroic figure which Spenser has depicted him, only as a free agent ; not otherwise could he have won our applause in Acrasia's Bower of Bliss—with compulsion on the other hand, out go the colours of the picture, both virtues and vices.

Alcohol is but one instance of habit, but the principles of preventive treatment adapted to it will in the main be the same as those adapted to any other habit of the kind ; and we may therefore sum up these principles as follows :—

In the first place, to control the purity and strength of the supplies.

To penalise, if need be, and as far as practicable, the state of intoxication.

To reform the “licensed” house, as far as possible, without branding it with the “*macula notæ*” of the censor, and placing it under surveillance. The Gotenburg System will in very many directions illustrate how this may be done.

To have recourse to "prohibition" only as a temporary and extreme measure, and only on the clearest call of urgency by an overwhelming majority—remembering that the strait-waistcoat is neither the highest form of appeal nor suited to a self-respecting nation.

Finally, to encourage all healthy attractions within doors and out of doors, in order to out-rival the enemy, and further to provide and facilitate the procuring of harmless or relatively harmless substitutes—*e.g.*, tea, coffee, cocoa, and the like—always remembering that intemperance may find its way into the tea-shop as well as into the bar.

There remain for consideration the medical responsibilities in respect of the prevention of habit. The medical practitioner has in keeping the intenser forms of natural agencies in order to meet those crises in life which come by way of accident or sickness, and it is for his use of these that he becomes responsible. In the great majority of cases the application of his remedies should be temporary, only rarely are they applied more or less continuously; but even so, unless handled cautiously, it is easy to start a taste for a drug which may develop into a habit. Thus there is no doubt that alcoholic intemperance has on occasion had its start in a careless ordering of stimulants and a forgetfulness to dis-order them when the need for their use had passed away. This is where the ethics of the *course* of treatment comes in, for the course implies the recog-

nition both by patient and practitioner that the malady is a temporary condition which has to be dealt with by temporary means, as by the crutch or the splint, the which, having served its purpose, is to be discarded. Where disease is of a more persistent nature—for instance, heart disease—we still find the value of the course of treatment, for in such cases we constantly note that the symptoms calling for treatment are the result of a temporary breakdown, caused by one thing or another, and that by a judicious course of rest and remedies we can bring back the heart to its starting-point (before the breakdown occurred). At this point, withdrawing the remedies, we may as a rule leave the patient to the compensatory mechanisms of Nature, *with a caution*. When we have to deal with a prolonged insomnia or a persistent pain we are confronted by more serious difficulties; but even then, supposing that we judge it necessary to meet the continuous disease by a continuous medication, we shall best avoid the dangers of habit by remembering its threatenings, and by using courses of substitutive drugs, if such there be, or by alternating the usage of drugs, *e.g.*, of veronal with paraldehyde and chloral hydrate, or such-like. It is the doctor's duty in all cases of prolonged administration of drugs to warn the patient of the dangers of habit and the need for restraint in the use of the remedies. This restraint is as much for the patient as for the doctor—perhaps even more; and if patients realised this at the start, they would be the more willing to bear that quantum

of pain which will enable them to keep within bounds the solatium proffered by Nature; which solatium then becomes a reward that has been earned. Thus viewed the sick-room has its own glory, though Horace forgets to enumerate it among the delights in his first Ode; certainly, "*Evehit ad deos*," it lifts to the gods.

CURATIVE TREATMENT OF HABIT

IT remains that we should consider the acquired habit as a *fait accompli*, and the means at our disposal for dealing with such. The solution of this problem will be arrived at best by first examining into the state of the chronic inebriate—the alcoholic, let us say. From three points of view this may be regarded, viz. (1) In respect of the grosser physical damage done to the tissues by the alcohol, as exemplified by the chronic inflammatory state of the upper part of the alimentary tract; by the serious and progressive mischief which may arise in the liver; and by the renal disorder which may be traced to the same cause. Each one of these may be followed by symptoms of the gravest import. (2) In respect of those lesions, which without sufficient reason we are apt to treat as more minute, those lesions which underlie mental failure in its milder manifestations, as in its most severe, *e.g.*, alcoholic insanity. (3) In respect of that moral *débacle* which a perverted character unfolds. There is no ground for separating the first and second sets of changes above mentioned, except that it is cus-

tomary to separate mind and body, for the reason perhaps that mind brings in more prominently that unknown quantity, consciousness. In either case we may assume that minute changes in cells are initiated by the contact with the circulating alcohol; such changes, indeed, arise almost universally throughout the body, and the above-cited instances are selected only because they are amongst the most striking. In the case of the third of the trio the physical basis of the effect seems to withdraw itself so effectively from pursuit that we are justified in setting it apart. Character, the *moral*, though expressing itself through the higher faculties of the mind, is still unlocated. Pushed home, it may be difficult to defend even this last separation without risking a doubtful metaphysical battle, so it will be safest to disclaim a strictly scientific classification in the above, and be content with the ordering as one that is customary and accepted.

We must pass by the physical changes which correspond to the first two headings; they show us physical sequences as inevitable as the movements of the ball that has been set a-rolling—the ball will continue to roll, and these sequences must be left to the compensatory adjustments of the body—to that *vis medicatrix* which seems almost inexhaustible in its resources, and which, wisely directed (herein consists the art of medicine), accomplishes oft-times the unexpected, if not the incredible. The treatment, therefore, of a fibroid liver, of an alcoholic dropsy, of a delirium tremens, is no present concern of ours, these stand related

to mischief already done, and, though the habit which has wrought these effects be absolutely arrested, the trouble set a-going will continue and will have to be met; that which does concern us is the arrest of the habit, and in this respect it is the *future* which we look at, not the past.

What, then, is the problem before us? It is the treatment of an organism which through the long-continued action of a force has acquired a bias, *i.e.*, a tendency, under the renewed incidence of the force, to move in a certain direction. This bias, if we will, may be termed a polarisation, for as the molecules of the iron bar under the influence of the magnet, so the cells of the tissues under the influence of the drug, have acquired a certain "set" or polarity. Briefly stated, then, the problem of habit cure is the depolarisation of the tissues.

In the foregoing chapter it was prevention which engaged our attention, and the doctrine there put forward was that no one was secure from habit, no one so strong as to be habit-proof—that alone was *safe* teaching. Now, however, habit having installed itself, we must teach that no one is so enslaved thereby as to be incapable of release—this alone is *right* teaching, justifiable, moreover, by records well substantiated, of recoveries from most desperate plights.

The most serious element in the problem of cure is the moral bankruptcy of the victim of habit: the strong places of control have been sapped and mined, and this, not in one direction alone, but generally. An important question arises in con-

nection with this ; desires enter in full stream by as many portals as the five senses open, probably by many other approaches also ; for instance, by what postern does ambition enter in its multitudinous guises and disguises ? Well, how stands Control in respect of this stream—can it be strong in one direction and weak in another ? It would seem not. There may be, in fact there is, gradation in the strength of desire ; it will be strong here, faint there ; here importunate, there apathetic. And, in correspondence, the task of control will be now arduous, now slight ; now will exact the whole energy of the man, now will be scarcely heeded ; but there is no evidence that towards two desires, different in quality but of equal intensity (we may postulate such), control can show an unequal front. Not that these two will announce themselves simultaneously, for the probability is that by whatever way they enter, however numerous their company, desires present themselves in single file only, for acceptance or rejection by one and the same personality, whether we name it Control, Choice, or Free-will — one act of Will at a time. The physiologist will point to the surface of the brain and show how to this part this function is assigned, to that part another function ; how consciousness is of this kind here, of that kind there—how, in a word, the brain works by compartments ; but whenever the perturbations of sensation are strong enough to engage the consciousness, and decision has to be taken, consciousness focusses itself upon that part, and the executive, in session,

determines there and then, not by compartments but as one governing body, upon each appeal in succession.

It has been objected that the slave of habit shows a remarkable tenacity of purpose in the pursuit of that which he desires.¹ This is a matter of vital importance which, if established, would call in question the whole theory and practice of the treatment of intemperance ; it is therefore essential that, in the case of the inebriate, we should in the first place determine whether we are dealing with an enfeebled will-power or merely with a misdirection of this power. Upon this question the experience of the world at large speaks surely with no uncertain voice. Is it not common experience, repeated again and again, that a life full of ability, full of expectation and shaping well, goes to pieces, loses direction and *purpose* once it has become the subject of an obsession of this kind? So true is this that when the unaccountable happens, and we see before us the frustration of powers which promised greatly, the suspicion arises almost involuntarily whether this wreckage may not be the result of some disastrous habit acquired. We see plenty of examples of misdirected will-power, but these people do not exhibit want of force when the power takes another direction ; and if habit were simply an instance of misdirected energy, why should not the inebriate in his lucid intervals manifest his old

¹ "The Drug Treatment of Inebriety," by Dr. Mary Gordon, "British Journal of Inebriety," vol. iv, 1906-1907, p. 167.

forcefulness? Still, it will be said, there is the fact of a persistence in a course of action in the teeth of the most energetic opposition, and but too often a persistence which gains the day. If this is not will-power, what is it? The answer comes, it is not *will* but *appetite*—persistent appetite. The habitual drunkard does not ride his desires, he is ridden by them—these importune, these impel. Fortunately for him, the opportunities for drink are often absent, and the man has his intervals of sanity. Unfortunately for him, the mental powers are often extraordinarily resistant to the poison, and though what is called cunning does not imply any high order of mental faculties, yet such as it does imply are all there; and, to his own destruction, the man is quick-witted enough to see through and round the obstacles which oppose the compassing of his desire. Given this sharpness of wit, given desire as a constant incentive, and the two together may well masquerade as will-power, and simulate it in their effectiveness. In his lucid moments the habitual drunkard will admit that he is killing himself, yet, will he nill he, persists. Is this force of will of any kind? It may be said, but not all cases are of this kind; there is also the dipsomaniac who has long intervals of abstinence, and presents none of those urgent bodily discomforts or physical longings which we call "*cravings*."¹ But these cases, which seem to

¹ "British Journal of Inebriety," *loc. cit.*, see pp. 159 and 163, remarks by Drs. Bedford Pierce and John Q. Donald in the discussion on Dr. Mary Gordon's paper.

approach nearer to forms of actual insanity, are still, apparently, instances of impulsions and compulsions, though the actual moving factor is obscure. From no point of view can the paroxysmal dipsomaniac be looked upon as an example of force of will.

In further illustration of this subject we may refer to the behaviour of the organism which has succumbed to one habit, should habit in another form come its way. It is common experience in such cases that the second habit takes root with comparative facility; for example, the morphinist flies to cocaine in the hope of overcoming his desire for morphia by means of the sedative influence of cocaine: vain hope: he will end either by substituting the craving for cocaine in the place of that for morphia, or by saddling himself with a combination of the two cravings.¹ The point in particular is this, that the acquirement of the cocaine habit has been made relatively easy by the pioneer work done by the morphia, which in establishing its own habit has broken down the resistance of the will. Incidentally, if this explanation hold good, it proves the solidarity of the will, that it works as a whole and not by compartments.

¹ See Brouardel, "Opium, Morphine, et Cocaïne," 1906, p. 112: "Au début, vers 1878, on employa la cocaïne pour combattre la morphinomanie, surtout en Angleterre et en Amérique. Mais bientôt on s'aperçut que l'on ne faisait qu'ajouter une habitude néfaste à celle de la morphinomanie, et suivant l'expression d'Erlenmeyer, qui le premier jeta le cri d'alarme, c'était tomber 'de Satan dans Belzébuth.'"

And now to deal curatively with this state of things. First in order of treatment will be the personal appeal, by any and every means adapted to reach the higher nature of the sufferer, whose will-power, buried under a heap of collapsed intentions and broken purposes, must be dug out. To succeed in this, viz., in holding the mirror up to habit, where habit is vice, so as to reflect it in all its deformity; in bringing this reflection into juxtaposition with the true dignity of force of habit, where habit is virtue, is to demand, on the part of the operator, the strong and sincere character free of all affectation, and innocent of all pretence: above all, it is to demand the compelling force of example. What success the personal appeal will achieve depends as much on the personality of the directing agent as upon the personality of the individual directed. Unless the former possess the insight which will enable him to perceive the strong points in the character to be influenced, the result must be comparative failure. Hence in proportion to the breadth of nature of the patient, his many-sidedness, in proportion to the interests and sympathies which he has in and with the world—his externality, in a word—so the chances of the appeal are multiplied, for all these aspects of his humanity are points of ingress. Again, in proportion to the depth of the nature to be influenced, the resources within, the ethical and moral convictions which have swayed at one time, though now no longer sufficient: in proportion to these standards of measurement of the inner man, so also will the likelihood of success

promise—provided always the nature of the appellant be quick to sympathise, quick to see and to occupy these points of vantage. The pledge administered by such an one is as unquestionably an instrument of power, as it is the emptiest of forms where these faculties of sympathy and of insight are wanting; but the pledge should be kept in reserve, like Napoleon's Old Guard, for last emergencies in this battle of the *personal appeal*. Of course, the wise counsellor will not be unmindful of the influence of the body upon the mind, nor neglect those adjuvant measures, dietetic, hygienic, medicinal, which may be called for to promote physical health, nor will the removal of the temptation to the furthest possible distance be less carefully regarded.

The personal appeal having failed, owing to an insufficient will-power on the part of the patient, sanatorium or asylum treatment becomes then the only alternative; but inasmuch as the chronic inebriate must himself consent to sign away his own freedom, personal appeal must still be made use of to persuade the patient to submit his will to the control of others.

The chief feature in sanatorium treatment is to be found in the inaccessibility of the poison to the inebriate during a period of time, sufficient, it is hoped, to enable the damaged health to be restored, and the enfeebled will to recover its power. In such treatment time is, of course, an essential factor; and if one will but take the trouble to

inquire into the history of the individual case, and learn how long the adverse influences have been in operation, how gradual the descent, moral and physical, which has followed, common sense will recognise how futile in most instances the brief sojourn in the institution must be. In the case of the patient the all-important step is to get him into the institution—a temporary self-surrender insures this; in the case of the friends and relations, however, the one thing needful is to convince them of the necessity of the prolonged stay, in the interests of all concerned; and to get the weight of their influence to reinforce the authority of the superintendent in order to keep the patient within those walls, the restrictions of which alone can give promise of success. The value of the sanatorium as a psycho-therapeutic factor is great; the unaccustomed surroundings, the routine and regulated life, the officialism, above all, the personality of the superintendent, in which everything centres—all these elements sum themselves up and yield a therapeutic momentum which we shall look for in vain outside the institution: properly conducted, it is very commanding. From these considerations it will be apparent how much the sanatorium is a one-man establishment, as indeed are all great institutions—governmental, educational, commercial, and how in the selection of the sanatorium its headship should be first regarded. System, impersonally, will do much, administration, personally, will do far more—it is precisely here that we want the *ipse dixit* of the ruler, and require that this should have an unquestioned authority.

Therefore we must see to it that this *ipse* embodies the right spirit—that here is the will-power which is to infuse itself into the empty vessels, which are brought to the sanatorium that they may be replenished.

Of course, system or method has its great value, and the kernel of the system here required must be educational—the will-power must be led forth from its retreat. If, now, the solidarity of the will be accepted, then this education must not confine itself to “the holesome reede of sad sobriety”¹ in respect of alcohol or morphia or any toxin whatsoever, but must take in hand the whole man—sobriety in all its aspects, and the less “sad” the better. Self-restraint all round will be the keynote which the institution must sound, and with this before us, is it not again clear how important a factor in the treatment must be its duration?

One further question with reference to the sanatorium: in other institutional treatments our eyes are being opened to the great moral and physical value of purposeful occupation—the sanatoria for the treatment of consumption are in point—cannot this same beneficial agent, *work*, be utilised more in the sanatoria for inebriates of all kinds, displacing the eternal round of amusement which becomes so wearisome?

We must now proceed to consider certain special means of treatment of the inebriate which may be applicable either to the free agent or to the inmate

¹ “Faerie Queene,” bk. vi, canto vi, stanza v.

of the sanatorium—namely, treatment by psychic suggestion and treatment by drugs ; we will take them in this order.

In the personal appeal, as in the influence of the sanatorium, psychic suggestion will be likely to play an important part ; but by “psychic suggestion” is now meant a special line of treatment which has been developed of late years by such workers as Richet, Liébault, Bernheim, Charcot, and many others—labours which have grown out of the facts of “animal magnetism” as exhibited by Mesmer in the latter half of the eighteenth century, and as subsequently investigated and carried forward by Braid in the first half of the nineteenth century.

It does not lie within the limits of these pages to examine into the methods by which suggestion is practised ; it is the results which these methods secure which concern us, and the state of the organism upon which these results depend. Briefly put, suggestion brings about a peculiarly impressionable state of being, in which the will of the person operated upon is more or less in abeyance, whilst his mind, and, through his mind, his body, are singularly at the command of the will of the operator. The most striking phenomenon of suggestion is the hypnotic state, which can be developed in various stages from a mere *somnolency* down to a profound *somnambulistic sleep*. According to the grade of the hypnotic state the *suggestibility* of the patient is greater or less, being least in the stage of somnolence, greatest in that of profound sleep ; in which last the hypnotised person seems to be in

complete submission to the will of the hypnotist.¹ In the hypnotic state an idea suggested by the operator is implanted in the subject, and if realisable tends to be realised; but the interest, from a therapeutic point of view, consists in this, that an idea, implanted whilst the subject is under influence, tends not only to be realised then and there, but may be made to persist in its potential activity for a greater or less period after the hypnotic influence has been withdrawn. Thus a dose of suggestion administered at the *séance* may continue to work during the everyday life of the subject. Psycho-therapeutics thus places at the disposal of man an influence strong for good or evil: this must be so, since ideas are good or evil and life is the realisation of ideas. To claim, therefore, that the idea which makes for good can alone be implanted and become effective is unthinkable. The serious nature of this problem is manifest, and the importance of the personal factor in respect of the operator is again emphasised. Putting, however, the question of the misuse of psycho-therapeutics wholly aside—every remedial influence may be abused—let us ask the question,—Supposing that the ideas suggested are desirable, and prove effective in securing the end desired, in what way is the patient advantaged thereby? To answer this we must regard the objective which we have in view, namely, the building up of will-power. Now, the habit before

¹ Bernheim on "Suggestion and Hypnotism," Hack Tuke's "Dictionary of Psychology," vol. ii.

us is proof of the loss of will-power, and short of its recovery nothing is truly remedial ; accordingly, however completely the habit may have been overcome in appearance, nothing will have been really accomplished unless the will have been revived. Short of this the treatment may be palliative, curative it is not. Does suggestion do this for us? The question may not be blinked : it is crucial.

A case in point will illustrate this best : A student at college, taking life not over seriously, was neglecting his studies ; unbeknown to himself, this student was influenced by a fellow-collegian, who, gifted with marked hypnotic powers, determined, by way of suggestion, that the truant should turn over a new leaf. Much to the surprise of the latter, and not wholly to his approval, he now found himself in diligent attendance upon the lecturers. In this anecdote, which is at first-hand from the operator, the question of the influence having been exerted without the knowledge of the subject is unimportant ; the point is that it was exerted, and that it worked independently of any initial will-act on the part of the subject, or of any subsequent will-effort, nay, possibly even in spite of a contrary volitional set. What is the conclusion to be drawn from such an account? It is that this now exemplary student is not one whit better than the good-for-nothing idler who once walked in his shoes. His reformation is no reform at all so far as he is concerned ; he has been reformed from without, but inwardly is wholly unregenerate ;

he is a whited sepulchre, within which the dead bones have not stirred ; he is an automaton, so far as this particular behaviour is concerned ; a marionette moving as the wire-puller wills. This is not reform in any shape or guise ; it is mere make-believe, and if this is all that suggestion can offer us we are far better without it.

But there is another possible *modus operandi*. The problem presents us with an enfeebled will-power on the one side of the equation, an inordinate desire upon the other. Expressed algebraically it stands:—

$$\text{Will-power} \overset{\leftarrow}{<} \text{Desire,}$$

according to which formula desire will move in the direction of the arrow, will-power receding. Now the wished-for end may be secured either by an accession of will-power or by a reduction in the force of desire, provided that the augmentation or withdrawal, respectively, suffice to reverse the sign, converting the formula now into—

$$\text{Will-power} \overset{\rightarrow}{>} \text{Desire,}$$

in which case, the will being in the ascendant, the movement is reversed and desire gives way.

Whether suggestion can *directly* so reinforce the will must be regarded as very problematic ; if it can it is a priceless remedy, the most excellent medicament we have yet acquired. But that it can blunt the force of desire, by so prejudicing the mind against it that the allurements lose appreciably in

their power of attraction, is indicated by much evidence. Working upon this side of the equation, the action of suggestion may be likened to the action of smoked glasses upon the sight ; by their means the brilliance which dazzled is taken out, and the eye enabled to look upon the object of vision and see it in proportions which no longer affright or allure. Assistance of this kind is surely legitimate ; and in fact do we not daily make use of such, both in the education of the child and in the re-establishment of the health of the sick, viz., by making light of the obstacles to be overcome in the forward progress, and in this way encouraging the essayal of a task which the imagination had pictured impracticable ? It will be remembered that the organism in the hypnotic state is peculiarly impressionable, and that the impression then made outlasts the hypnotic stage : advantage is taken of this and desire so transformed that the will again becomes operative—the Sirens' voices are still heard, but the bonds of Ulysses can be loosed, the ears of his companions unstopped, for the strains have ceased to captivate. The all-important point will then have been gained, the will has once more become operative, and has begun *revocare gradum* ; for, according to the law universally applicable to living things, the will grows with use, as formerly it wasted with disuse.

True, the start is not an unaided act ; another has had to step in and make this possible by lessening the hindrance, and to do this has had to spend of his own energy ; but between the

assisting the sick man to walk, and the lifting him up and carrying him, there is all the difference in the world ; to help another to help himself is good practical morality the world over, and sound spiritual economics. Let it not be thought that considerations of this kind are unimportant, they are fundamental and all-important, for they touch the character of the man.

We come, finally, to consider what part the drug can claim to play in the cure of habit. Though we are not without the "sweet oblivious antidote," yet we are constrained to confess that it can neither "pluck from the memory a rooted sorrow," nor "raze out the written troubles of the brain," just as little as it can reinstate the imperious will upon the throne which it has abdicated. But there before us the problem stands, there is Habit, its formula—

$$\text{Will power} < \overleftarrow{\text{Desire}},$$

desire therefore compelling ; and just as the spacious fields of Desire spread themselves out as fields of operation to suggestion, so we must take it that here, if anywhere, will grow the opportunities for the medicament. And why not? The five senses are so many portals of admission to desire ; they are of the flesh, and the flesh is grass and akin to, and in touch with, all things that grow, even to the crystal, which is not without its movement and its growth. How, then, should the medicament deriving from the same parentage not seek and find its "acquaintance" here? Not only is the claim

reasonable, it would be unintelligible were it otherwise ; moreover, it will be borne in mind that the claim is for adjuvant action only, drug treatment being content to take the lower room. Habit personified brings to us the enfeebled body along with the enfeebled mind and character. We know how close is the association between the physical and the psychical, how either acts upon and reacts to the other : our task must, therefore, include the bodily ministration. Here come the impaired nutrition, the debilitated and vitiated circulation, the defective aëration, the faulty digestion, the inadequate elimination, the toneless nervous system—one and all they claim our assistance, dietetic, hygienic, *medicamental*. A marked feature in the general atony which prevails is a state of hypersensitiveness forming a kind of weak irritability, the sign of instability. Here surely is ample scope for the wise use of the sedative, the tonic, the nutritional stimulant, the eliminant, and without question treatment which ignores these aids will fall short of the best therapy. The drug, we have seen, carries with it, or may be made to convey, certain psychic effects, adventitious, it is true, but not the less real because of this, and which, adding themselves to powers more intrinsic, enhance the effectiveness of these. The ideational value of the drug has its legitimate sphere of usefulness for the honest man ; this value we should forgo did we set the medicament aside.

In respect of the drug treatment of inebriety we must, however, be reasonable ; we must not expect the wonder-cure. We must remember the long

period of spoiling which has gone before, and that stability cannot grow out of instability at a moment's notice—that, in a word, Time must be the essential factor in the habit-cure which is to last. Granting all this, there is room undeniably for the use of drugs in the treatment of habit ; we shall scarcely expect the specific, but we may look for special remedial values, here and there, adapted to meet the special tissue-degradations which habit has wrought. For one form of drug alone there is no room,—the secret remedy ; since whatever real value it may possess is as nothing when compared with the mischief which secrecy brings with it.

Drug cures for habit may bear the name of this or that person ; such is the case, and quite justifiably, provided that everything is aboveboard and the name do but record the authorship of a definite plan or method of treatment. Indeed, here, if anywhere, the methodical routine course of drug treatment will be essential, as contrasted with discursive haphazard medication, which must be fruitless ; and it may be said that, as a general rule, the medicinal course will be likely to secure the best results if it take place in the sanatorium or institution. The reasons for this have already been assigned.

We may call, then, upon drugs to make amends and assist in undoing the harm which the abuse of drugs has wrought, and thus still further open out the range of their usefulness. Hither they are brought from the Levant, the Indies, the Americas, from all parts of the world ; here in the market-

place you shall find them—the capsule, the leaf, the bark, the root, the drugs, the dry things. Has all this labour of the present day and of so many centuries been in vain; have we gathered after all but a heap of worthless dust? Is the drug a mistake from beginning to end? No; this dust is brimful of energy, its particles are literally alive, and as this energy is applied rightly or wrongly, so the result is life or death. Does any one doubt this—any one doubt the death-dealing powers of the drug? No, upon this we are all agreed,—the drug can kill. The doubt then is only as to its life-giving powers? It would seem so. Verily an instrument of the wrath of God: this were poison of a truth, energy which no wit of man could divert from the paths of destruction; but this, precisely this, is unimaginable, for we know of no forms of natural force which act thus, and these activities of the pharmacon *are natural forces*. There is the very root of the matter: straight from the lap of Mother Nature do they come. The Hygienist will say, But let us apply natural means, not these drugs, these artificial, these “dry things.” Artificial? well, yes, they are; but the Art which has made them is the incomparable Art of Nature, outside of which, friend, strive as we will, we cannot get.

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